ELECTRICAL WORLD

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NEW DEALERS COVET THE UTILITIES
RAYMOND S. TOMPKINS

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ACCURATE LINE FAULT LOCATION
J. E. ALLEN and G. J. CROSS
Pennsylvania Water & Power Company

•

INCLUDE ELECTRICITY IN RENTS
R. R. SMITH
Federal Emergency Administration of Public Works

•

NEW RURAL UNDERGROUND CABLE
F. L. AIME
Anaconda Wire & Cable Company

•

SELLING IN ALABAMA
L. W. W. MORROW

•

ELECTRICITY CUTS MOLDING COSTS
JAMES B. HOLSTON
Wagner Electric Corporation

•

BREAKER DUTY, VOLTAGE RECOVERY

•

UTILITIES NEAR 1929 LEVEL

•

JONES ON INDUSTRY PLANNING

JULY 20
1935

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ELECTRICAL WORLD

FOUNDED IN 1874 ● READ BY ELECTRICAL MEN FOR SIXTY YEARS

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PAUL WOOTON, Washington Correspondent — C. W. LEIHY, Pacific Coast Editor

Reader's Guide to This Issue

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LETTERS TO THE EDITOR

Advocates Emphasis on Dehumidification

To the Editor of ELECTRICAL WORLD:

When reading on page 28 of the June 8 issue of the ELECTRICAL WORLD the paragraph under "Air Conditioning and Physiology" I thought of the familiar saying that "Many a truth is spoken in jest."

From an engineering standpoint we can produce different degrees of humidity and different degrees of temperature, and as engineers we have also determined in some way so-called comfort zones. Inasmuch as air conditioning is a very desirable load to be promoted from the standpoint of the electric utility, it is interesting to observe the effect of air conditioning on those who are exposed to it. My own observation, supported by the comments of people who are living in air-conditioned areas, leads me to believe that more attention could be given profitably to the "practical" effect of existing air-conditioning installations in order that new installations and remodeled old installations will really provide the comfortable condition which we attempt to furnish during the hot weather.

Air made too cool

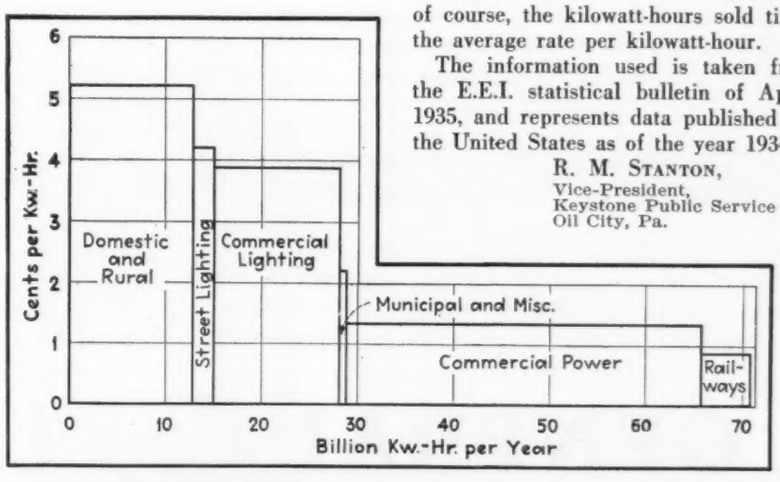
Generally speaking, it has been my observation that the air is cooled too much with two objectionable results: One, the difference between outdoor and indoor temperature is too great, leaving a very disagreeable effect, particularly when staying a long time indoors and when coming from indoors to outdoors; second, on account of the relatively low temperature of the air entering the conditioned area drafts are prevalent, with ill effects on those who have to sit in such areas throughout the entire day.

Dehumidification is often accomplished by depressing the temperature of the air without making adequate provisions for reheating this air to a more suitable temperature. Real progress in mass selling of air conditioning will not succeed until more suitable conditions are created, not from the standpoint of the engineer, but from the standpoint of the people who will be living in the air-conditioned spaces. To do this it seems to me it will be necessary to provide the dehumidification of the air independently from the cooling, with the cooling reduced to a very moderate amount, certainly not to exceed 10 deg. difference between outdoor and indoor temperature, probably 5 deg. being a more suitable difference, always keeping the thought in mind that a thorough job has been done in dehumidifying the air.

In New England, particularly in most of the domestic applications, a satisfactory job could be accomplished by confining the efforts of air conditioning to dehumidification and circulation without any cooling. I also believe that such equipment can be developed and operated at costs which would facilitate their sale. This same argument might apply to many office spaces where the occupancy is relatively light. For commercial establishments and offices with heavy occupancy, of course cooling must be added.

We have obtained some data with regard to wet and dry bulb temperatures. For the year 1931 the area represented by the "effective" temperature above 71 deg. was 323 degree-days, while for the year 1932 this same area was only 231 degree-days. We reached the conclusion that the dehumidification part of the air-conditioning process was the one which should receive far more attention; however, at that time no satisfactory independent means were available. There will undoubtedly shortly be a marketable product in which dehumidification will be done independently from the cooling and will be controlled independently. It will then be possible to install dehumidification without necessarily having to install cooling facilities. I believe that for our territory at least that will be a great help in selling air conditioning.

E. J. AMBERG,
Research Engineer,
Connecticut Light & Power Co.,
Waterbury, Conn.



A way to convey three comparative pictures in one graph

Asks About Stock Index

To the Editor of ELECTRICAL WORLD:

The market price fluctuations of power and light common stocks are reported in each successive issue in the form of index numbers plotted on a chart. For a better understanding of this index we wish to know the names of the thirty-seven companies used in compiling it.

FAYETTE S. WARNER,
Chief Research Division,
Federal Power Commission.

[The list follows.—EDITOR.]

American & Foreign Power, American Gas & Electric, American Light & Traction, American Power & Light, American Superpower, American Water Works & Electric, Cities Service, Cleveland Electric Illuminating, Columbia Gas & Electric, Commonwealth & Southern, Commonwealth Edison, Consolidated Gas, Electric Light & Power of Baltimore, Consolidated Gas of New York, Detroit Edison, Duke Power, Edison Electric Illuminating of Boston, Electric Bond & Share, Electric Power & Light, Engineers Public Service, Federal Light & Traction, Long Island Lighting, Louisville Gas & Electric, National Power & Light, Niagara Hudson Power, North American Company, Northern States Power, Pacific Gas & Electric, Pacific Lighting, Pennsylvania Water & Power, Public Service of Northern Illinois, no par, Public Service of New Jersey, Southern California Edison, Standard Gas & Electric, Standard Power & Light, Tampa Electric, United Corporation, United Gas Improvement.

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Sales and Rates in Single Graph

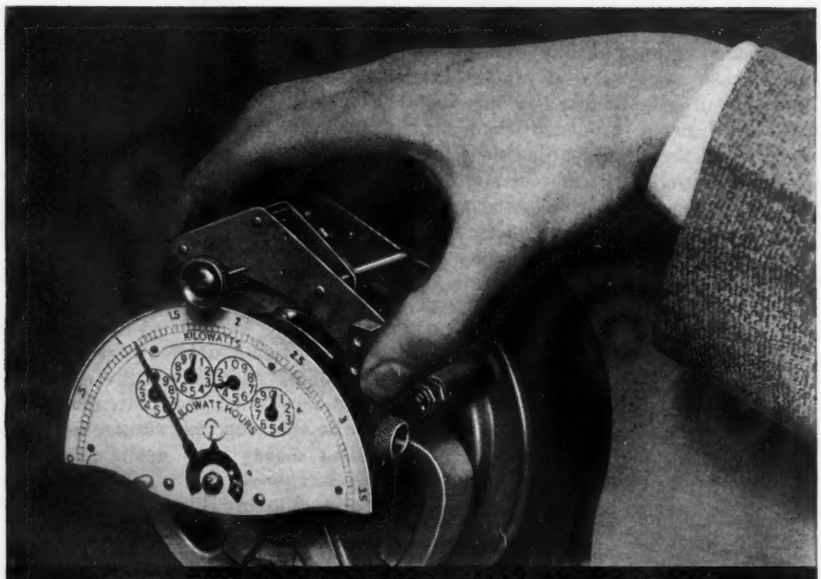
To the Editor of ELECTRICAL WORLD:

Attached is a graph which will, I believe, be found interesting because of the information which it is possible to portray in this manner. It will be noted that there are shown graphically three comparative pictures; first, the relative kilowatt-hour sales to the various classes of customers; second, the average revenue per kilowatt-hour for the various classes, and, third, the comparative revenue from the various classes. The revenue is represented by the area of the chart for each classification and is, of course, the kilowatt-hours sold times the average rate per kilowatt-hour.

The information used is taken from the E.E.I. statistical bulletin of April, 1935, and represents data published for the United States as of the year 1934.

R. M. STANTON,
Vice-President,
Keystone Public Service Co.,
Oil City, Pa.

Why THIS Universal Acceptance OF THE G-E M-20 DEMAND REGISTER



HOW THE M-20 SAVES TIME IN TESTING

Here is just one specific reason why the M-20 has proved popular. It is the unique, portable self-checking adapter for manual operation. With it you can make an overall "accuracy" test in about one minute. It is simple and saves time.

THE G-E Type M-20 demand register has now rounded out more than a full year's service. Favorable reports from many users, and the large number of repeat orders, are indicative of the widespread acceptance of this new register.

THE REASONS WHY

Here is a design that you can depend on for: Long life . . . Sustained Accuracy . . . Safety . . . Dependability . . . Convenience . . . and Flexibility of Application. These all mean dollars saved.

Combined with low first cost, low installation cost, simplicity of testing, and reduced maintenance, they sum up the reasons for the popularity of the M-20 register.

NEW PACKING BRACKET

Other advantages are now being offered. One is a new packing bracket which gives added assurance that the register will arrive in good condition. It also makes the register easier to inspect and gives greater protection while being handled. This new bracket is intended to save you time and expense.

NEW ECONOMIES NOW POSSIBLE

Some of your older G-E registers may need renewal parts. Before undertaking such work, consider the cost of the parts and of the labor involved and then compare the total with the low price of the new M-20.

Perhaps a small additional investment will give you new registers and, with them, longer and more dependable service as well as many other time- and money-saving features. Ask a G-E meter specialist to tell you more about these new economies. Address the nearest G-E sales office, or General Electric, Dept. 6A-201, Schenectady, N. Y.

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GENERAL ELECTRIC

ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

JULY 20, 1935

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At the Critical Stage

DECISION on the utility holding company bill is to be had soon. It has arrived at the House-Senate conference stage. Its fate now depends upon the conference committee report and final action by Congress. The issue is still critical as augmented pressure is being brought to bear by the enemies of the industry. There can be no let-down on the part of those who favor a fair deal for the utilities. The fight is still on.

The issue is largely political despite the facts presented on behalf of the industry. Being political, several possibilities can be envisioned. The holding company bill may die in conference. It may emerge with the "death sentence" reintroduced because of the augmented political pressure placed upon this action. Or once again the House may declare its independence and refuse to take orders that are not in the public interest. In any event, no one but an incurable optimist would say that the utilities are out of the woods.

There is a threat that the Administration may make the utility issue a blatant one in the coming election campaigns. This is part of the pressure to get destructive legislation. It is a bluff. We believe with Alfred E. Smith that the utilities would be a fizzle as a campaign issue. The public is tired of the unjust persecution of the utilities. The industry would be served and not injured by an issue that would place the facts about the industry before the voters. But members of Congress are now afraid of shadows, and this type of intimidation may be effective. We hope not.

Then, again, we have the lobby investigations. These are political moves to defend the respective positions taken by the Senate and House and to bring added pressure to bear on utility legislation. The Senate committee came off second best with Mr. Gadsden. He frankly gave all data and said the industry had the right to present its case. It was the responsibility of its leaders to defend the interests of employees, stockholders and the public. They proposed to do this openly and actively. The House committee is drawing out the facts about the Administration lobbyists who seek to destroy the industry. We hope it gets the full story. Essentially, however, these lobby investigations are political moves to affect utility legislation and indicate that the proposed legislation is at a critical stage.

WE HOPE Congress will retain its perspective and integrity despite the acute development of politics as the guiding influence in legislative decisions during the closing days of Congress. We hope the fanfare and bluff of the enemies of the industry will not serve to overcome the facts and policies presented on behalf of the industry. The evidence is overwhelming against the destructive utility legislative proposals.

The testimony over a long period shows that no group of voters wish to destroy the utilities. The issue today, as at the start, rests solely upon the actions of a few enemies of the industry who are in a position to wield political influence. This minority in Washington represents neither good business judgment nor votes. It creates a froth to try and obscure the underlying evidence. We count upon Congress to weigh these facts and act accordingly.

·TRENDS·

T.V.A. No Longer a Yardstick

ALL "yardstick" elements of the T.V.A. are thrown out in the new legislation that will give this pet project more money and more power. Cost accounting, selling power at no loss, fair dealing with competition, supervision of the use of funds under the law—all these count for little in the opinion of Congress and the T.V.A. directors. In its power aspects, this project can prove nothing and show nothing. The "yardstick" becomes a rubber band if the new legislation passes. If the project is a legitimate power yardstick, why should there be objection to accurate accounting, supervised expenditures and an intelligent balancing of expenditures and revenues? This is the key to the new legislation. T.V.A. cannot and will not meet an economic test of accomplishment. It is a social and humanitarian day dream.

Act for Rural Electrification

IN THE last issue Morris L. Cooke gave an interview outlining quite definitely the plans and policies of the R.E.A. This deserves careful reading and action by the industry. The work and policies are still in a formative stage and can be modified. All experienced in rural electrification appreciate its economic and service difficulties and how unsafe it is to generalize from specific projects. But the ideas of at least 1,200 kw.-hr. per year use, of no subsidy, of simple rates, of construction to meet service needs, of local voluntary development of projects are all sound in principle and capable of being put into practice in at least a limited way. The policy of the industry should be to study its rural possibilities and to develop them as rapidly as possible. This can be done with any degree of co-operation with R.E.A. that is deemed advisable and practicable in each installation.

The Jubilee Illumination

COLOR photographs of the Royal Jubilee floodlighting in England, recently arrived, are as fine as anything we have seen. Views from many cities show that an outstanding job has been done. It is no small satisfaction to electrical men that they are in an industry that has the privilege of contributing so richly to the public enjoyment of such great national festivities.

Interconnection, Not Economy

TOO frequently electric service is considered a dollar-and-cents business to be measured in costs and returns. It is in reality a service. The current floods and storms bring this out. In one district a municipal plant was incapacitated by floods. It now seeks an interconnection. In other areas interconnected systems enabled cities and towns to have a maximum of service and a quick return of service. Private utilities have made interconnections to give service just as much as to make economies in operation. They have learned through experience that interconnection is valuable in times of storm, flood and accidents. Valuations and a study of physical facilities under normal operations do not give a true picture of the business. This is part of the difficulty the industry encounters in presenting its case on a cold-blooded balance sheet basis. It is a reason why the service and costs of a local utility should not be compared to those of one serving a large area through an interconnected system.

From Pen to Platform

ONE large company recently had its engineers tell in ELECTRICAL WORLD of a unique accomplishment that embraced plenty of pioneering. Another large company was intrigued and asked to have the author retell his story in fuller detail to the engineers and operators of the other territory, also experimenting in the same direction. The author tells us that they have offered to tell him all about their experiences when he goes. The word is forum.

Midsummer Valley in May

AS A thermometer the output of central stations registers upside down; it is lowest in the period of hot weather and does not begin to rise until autumn. That is, under ordinary conditions. But this is not a normal year; the rise, a sharp one, came in June; May, not August, seems to have marked the low point. With an extra three months to go, the winter load will have time to build up to a higher peak than any one has dared to predict. The jump coincided with the Supreme Court NRA decision. Can it be that the demise of the Blue Eagle advanced the season by a whole quarter, or did it just happen?

Over There and Over Here

IN AUSTRIA electrification of 50 miles of mountain railroad has just been completed. A substation and 110 miles of high-tension line were built—part of a work-creating program—material supplied by Austrian firms. Skilled workers in industries were helped as well as local laborers. But our government is planning to put nearly $5,000,000,000 into "direct" labor, forgetting the idle workers of cement mills, mines, machinery shops, electrical plants and railroads. It doesn't make sense.

Air Conditioning "High" Moving Eastward

HOME air conditioning may not after all trail the adoption by commercial establishments. The prefabricated house idea is taking hold and that will give an impetus. Washington, D. C., has a home-building promoter who is putting up 48 new $12,000 homes of the other kind with year-round control of their indoor climates.

The Editors Use a Spotlight on Current Happenings

With this comfort, of course, goes all the customary paraphernalia of the electric home. Homes without refrigeration are getting to be relatively unsalable and unrentable. Air conditioning is crowding the heels of mechanical refrigeration.

Those Youngsters' Eyes

"SIGHT-SAVING CLASSROOMS" can be sold this summer with electron tube control that will adjust intensity to suit the day. Duquesne Light Company is making an effective drive for installations during vacation. The idea should be presented to parents and school boards now.

And the Cost of Sales

WE ARE amazed at times that some utility executives still do not appreciate the profit value of a sales staff. They continue to think as engineers and operators rather than as business men. Yet aggressive selling is the sole defense against loss as well as the only road to growth —the only safe insurance for any commercial enterprise. Sales methods and accomplishments and the cost of sales are now prime executive responsibilities.

Maintain Contented Customers

FOR years the technique of public relations has been argued and practiced in a dozen variegated and moderately successful ways. Reducing rates has been the most universally successful answer and, as long as it can be sustained by compensatory load building, will always be a powerful palliative. Staying profitable, unshaken, vigorous and orthodox, too, is a thing for which the utilities are regarded as primary anchors to a constitutional foundation for an enterprising country. These are positive contributions to public relations, but they carry little humanized emotional appeal. During the next six months the utilities must supplement these accepted accomplishments with a program of public approach that will refute the proselyting propaganda which has flowed out of Washington for three years. Too many utility customers have been seduced to think vaguely, "I don't like the X company." What they mean is they don't know as much as they wish that is good about that company and its individual service to them. The stockholders did their job nobly in massing for the defense of their industry. The best line of defense for utilities will have to be an army of satisfied customers. There are some months ahead in which to convince them they have reason to be more than contented. To do just that is the inescapable duty of utility management for the second half of 1935.

Refrigerators, Yes, But Who Owns Them?

OUT of the Department of Commerce comes the first correlation of data on incomes and consumption derived from information on both income and purchases reported by the same families, 1,697 of them in Austin, Tex. Three-fourths were white, one-sixth negro and the rest mostly Mexican. Electric cooking is negligible and gas lighting is nil. Fifteen per cent of all families have refrigeration, more than half the $3,000 and up families having it. Refrigeration-equipped homes are occupied by an average of nearly 25 per cent of all families with incomes from $1,000 to $3,000. Two-thirds of the $5,000-$7,000 income homes have refrigeration, the highest percentage of any group, but the honors for totals go to the $3,000-$5,000 class. That kind of information shows where to cultivate first, second and next.

To Revive the League Council

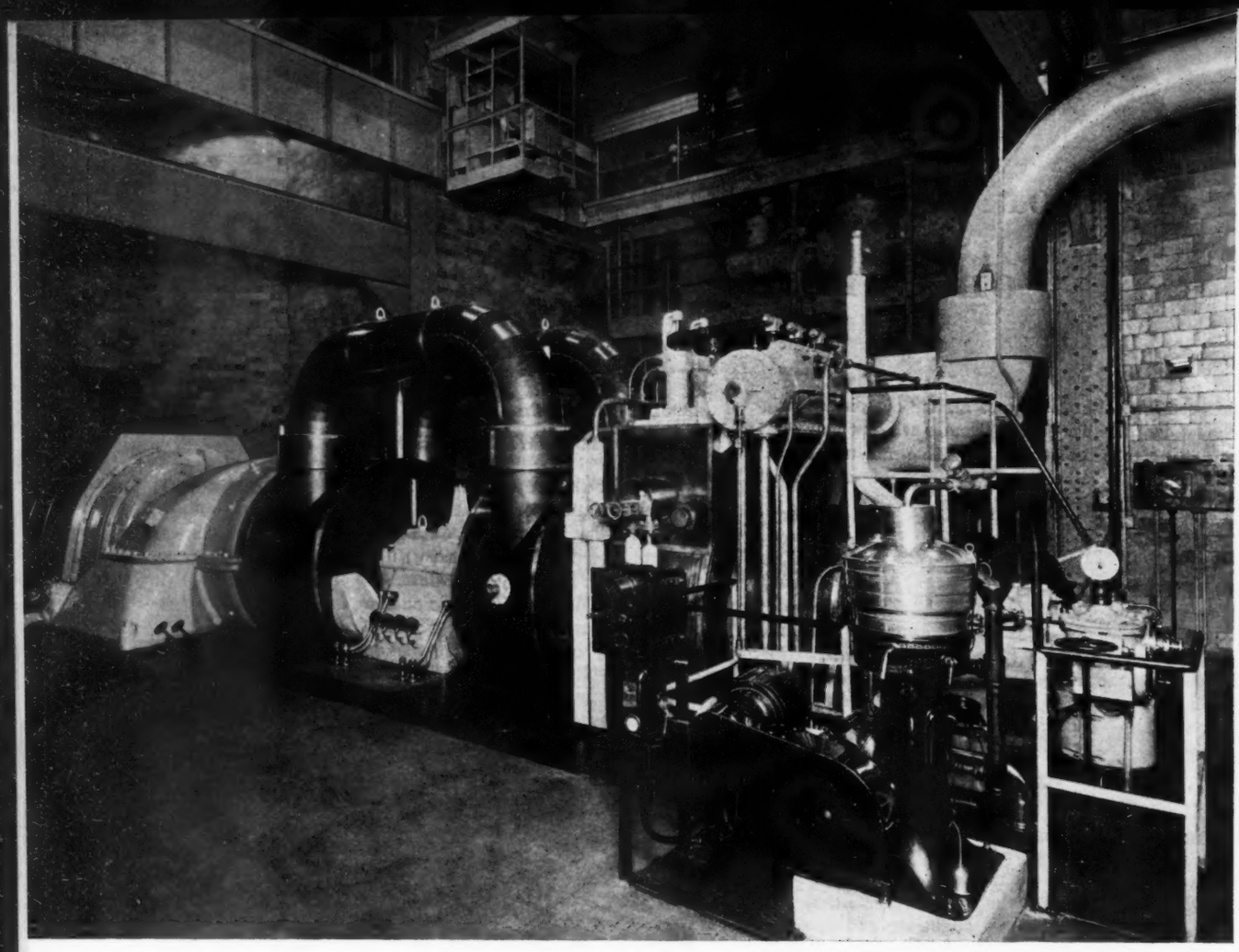
LEAGUE managers from about the country meet next week in Cleveland to decide whether to re-establish the League Council, that died awhile after the S.E.D. With utilities and local trade steadily increasing their co-operative selling, it is a sound move. N.E.M.A. has worked hard to encourage and support constructive leagues. A League Council should be useful.

New Facilities Needed

SOME companies no doubt still have an abundant margin of generating capacity to meet next season's requirements easily, but meanwhile shifts and local gains in the industrial load are calling for transformers and line material. At the same time the domestic load, which is taking as much energy each month now, in summer, as it took in January of 1929, is obviously headed toward an unprecedented peak next winter. Despite political obstacles, the increasing demand for electric service must be met with increasing facilities.

Double Appeal Stimulates Demand

SINCE decorative appeal has been added to the scientific design of portable lamps specified by the Illuminating Engineering Society, public interest has been greatly stimulated in improving home illumination, judging from the number of "I.E.S. certification" tags issued by the Electrical Testing Laboratories. Since June 1, 1934, more than 500,000 of these tags have been issued, according to recent reports.



HERE IS PROGRESS

While tax dollars by the hundreds of millions are being poured out for water power, which employs an art that, if not obsolete, is incapable of any further major improvement, the dollars of private enterprise march in step with the inexorable advance of progress. The energy in steam is related to its temperature. Back only a few years ago steam at 600 deg. F. was about the limit. Then with development of new steels, alloys with properties little short of marvelous, the steam temperature rose to 700, to 800, and in this machine to 1,000 deg. F., with accompanying increase in the efficiency of electricity generation. The engineering and research talent of the Detroit Edison Company have devoted unstinted attention to this high-temperature turbine development for the benefit of everybody.

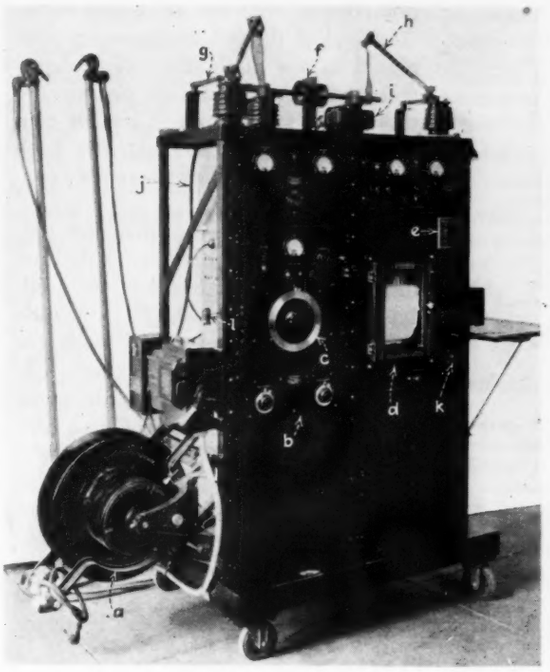
Accurate Line Fault Location

A Time-Saving Method Independent of Nature of Fault, Applicable by Regular Station Attendants, and Highly Accurate

By J. E. ALLEN . . . G. J. GROSS
Chief of Tests — Testing Engineer
Pennsylvania Water & Power Company

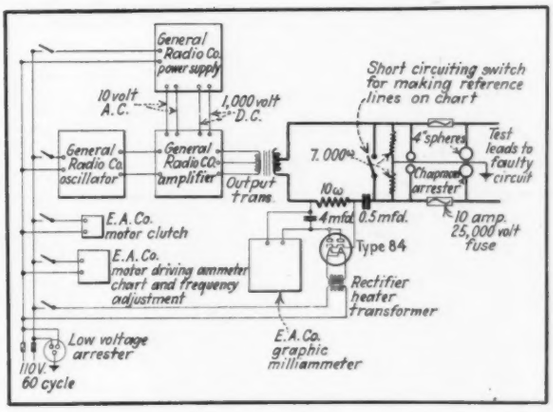
WET snow and sleet have not only constituted one of the commonest sources of transmission-line mechanical failures, but they greatly impede location of faults by patrolmen. In one case, where patrolmen were stationed about 10 miles apart, adverse weather conditions delayed location of a line failure fourteen hours. To facilitate the location of line faults a high-frequency method has been devised which has five major advantages:

1. Less than one-half hour is required for the determination of the fault location on a three-phase line.
2. Determination of the fault location is not dependent upon the nature of the fault; i.e., open wire, short circuit or ground.
3. No communication is needed with either the patrolmen or any other station (except in case it is necessary to sectionalize a line).
4. Apparatus can be operated and fault location determined with the regular station attendants.
5. The accuracy of the location in most cases is within 2 per cent.



Graphic ammeter records succession of current-peaks produced with rising frequency; location of fault is a function of frequency separation of these peaks. Set is operated from 110-volt, 60-cycle outlet and is connected to transmission line by test leads and hot-line sticks. Aside from equipment for impressing variable high frequency on line under test, apparatus is incorporated in the set for protecting it and operator from contact of test line with live power line and from voltages induced in test line by parallel circuits. Ammeter chart is mechanically tied with oscillator frequency control so current is recorded as function of frequency impressed on test line.
(a) 220-volt cable reel; (b) oscillator panel, (c) calibrated frequency dial; (d) graphic milliammeter; (e) motor and clutch switches; (f) sphere gap; (g) drain resistor; (h) 25-kv. fuse; (i) arrester; (j) test lead to faulty circuit; (k) manual clutch control; (l) manual frequency control.

Figs. 1 and 2—Frequency set for locating line faults



When the source of gradually rising frequency is impressed upon one phase of the line and the current is recorded on a graphic ammeter it will be found that at certain frequencies the current rises to sharp peaks. A succession of the current peaks will occur at equally spaced frequencies. The frequency interval will be a measure of the distance to the fault, which may be calculated from the formula $L = V \div 2d$ where L = distance in miles, V = wave propagation in miles per second (previously determined by test for each circuit) and d = average difference in frequency between current peaks.

The theory underlying this phenomenon involves the reflection and phase shift which a current impulse undergoes when impressed on a transmission line having distributed capacitance and inductance. At certain frequencies dependent on the distance to the fault the reflected wave will return to the sending end in phase with the second successive impulse, reinforcing it and producing a condition of minimum impedance or maximum line current.

The absolute frequency at which the first current peak occurs is helpful in diagnosing the fault. For example, it will be exactly one-half the frequency interval between successive peaks, if high frequency is applied between a conductor and ground and if the conductor is open at the fault. On the other hand, it will be equal to this interval if the conductor is grounded.

Since the interval between peaks is always the same, regardless of how the frequency is applied or the nature

of the fault, only three graphic records requiring three minutes each are needed to permit a fault location to be determined.

The apparatus and method of applying it to faulted lines are shown in accompanying illustrations.

The oscillator operates on the beat-frequency principle and provides an adjustable source of frequency from 100 to 100,000 cycles, obtained by the difference between a fixed oscillator of 500 kc. and one variable between 500 and 600 kc. Its range was based on two requirements: (1) That the minimum frequency should be less than $V \div 4L$, where L is the length of the line to be tested, and (2) its maximum frequency should be greater than $V \div L$, where L is the minimum length of circuit within which no fault location determinations are desired. Having nearly linear characteristics of angular rotation versus frequency increment, and operating through an angle of 270 deg., the main frequency dial may be read within 100 cycles over its entire calibrated range.

For measuring the current change to the faulted circuit with frequency change, an Esterline-Angus type AW direct-current graphic milliammeter is connected with a rectifier and shunt as shown. Instrument deflection is improved by the 4-mfd. shunt capacitor. To draw current ordinate lines at the limit frequencies of 100 and 1 kc., denoting the beginning and end of a test record, a short-circuiting switch across the output leads permits building up the output current to full-scale value by manipulation of the oscillator voltage control.

Since the record derived from the graphic ammeter must have a frequency instead of a time abscissa, the chart drum is mechanically coupled to the oscillator condenser so 18 in. of chart will correspond to the full-frequency range of 1–100 kc. To raise the frequency uniformly and correspondingly advance the ammeter chart, the drum and condenser dial are jointly driven by a geared-down continuously running motor engaged only when the solenoid clutch is energized.

The paper on which this article is based won the James H. McGraw first prize, awarded at the Atlantic City convention of the E.E.I.

The faulty circuit is preferably turned over for the test with the far end ungrounded, although if it is grounded it will not be a detriment. One lead of the test equipment is connected to one of the three-line phases and the other two-line phases are grounded. The other test lead is connected to ground so that the high frequency is applied between conductor and ground.

Preliminary to recording the current peaks the motor driving the ammeter chart is energized and the oscillator dial set at 100,000 cycles by driving the chart forward with the motor so as to avoid backlash. At this frequency the pen is made to deflect full scale so as to provide a zero reference base in scaling off frequency when the chart is removed. When the circuit is in readiness for test, the plate voltage and grid bias of the amplifier are adjusted and the voltage control of the oscillator set at about one-half scale. Then the chart is started with the motor clutch, and the amplitude of the current peaks watched as they appear so as to readjust the oscillator voltage control if necessary. At the end of three minutes, when the oscillator has decreased to 1 kc., the chart is stopped and the oscillator set back to 100 kc. in readiness to test the next two phases.

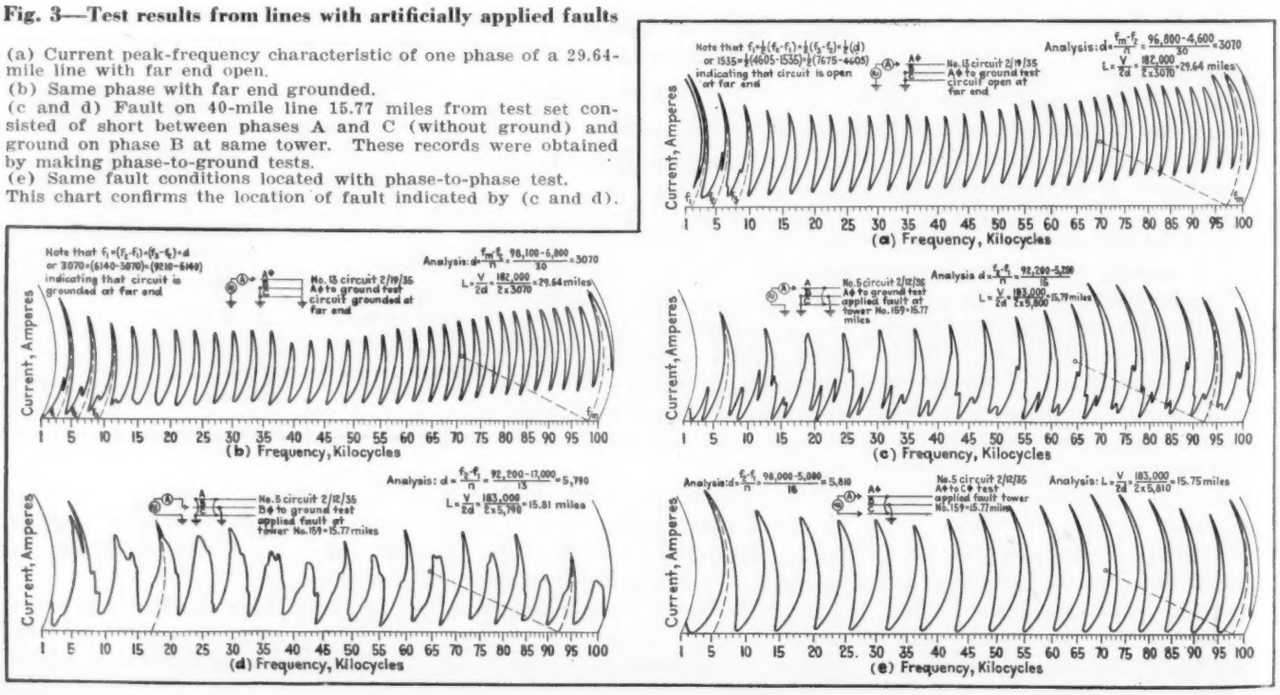
The three charts thus secured are then provided with an abscissa scale by means of a rule graduated in frequency corresponding to the dial calibration of the oscillator. The frequencies of the first and last well-defined current peaks are read from the scale and the difference divided by the number of "valleys" to obtain the average difference between current peaks. As previously mentioned, the desired result can be obtained by substituting this value in the formula $L = V \div 2d$, but time can be saved and the location of the faults indicated in more usable form if a table has previously been prepared for each line like the following:

Average Frequency Difference, d in Cycles	Distance to Fault, L, in Miles	Corresponding Tower Number
9,175	9.97	100
9,105	10.05	101
9,020	10.14	102
8,935	10.24	103
8,830	10.36	104

It is necessary to analyze each of these three charts on account of the possibility of each phase having a fault at a different location. Three additional records are taken with the test leads connected between phases,

Fig. 3—Test results from lines with artificially applied faults

(a) Current peak-frequency characteristic of one phase of a 29.64-mile line with far end open.
(b) Same phase with far end grounded.
(c and d) Fault on 40-mile line 15.77 miles from test set consisted of short between phases A and C (without ground) and ground on phase B at same tower. These records were obtained by making phase-to-ground tests.
(e) Same fault conditions located with phase-to-phase test. This chart confirms the location of fault indicated by (c and d).



leaving the third phase ungrounded. These records, depending upon the nature of the fault, serve as a possible check on the location obtained from the first three records.

Experiments have shown that a between-phase fault without ground may be located in the first three tests by grounding the two idle phases at the testing end. Otherwise, as many as six records might have to be secured before obtaining one suitable for analysis. The reason for this is that the records secured by the phase-to-ground connection without the two other phases being grounded would result in distorted or irregular curves incapable of analysis, due to the effect of the multiple conductors connected to the phase under test.

Analysis of charts

Judgment must be exercised in the analysis of the charts on account of the distortion sometimes present in the current peaks. However, distortion of individual peaks must not be confused with charts showing a lack of regular repetition. The latter may be frequently encountered and must be discarded. Errors in analysis due to distortion arise because of the uncertainty in defining the exact peak, but such errors are usually reduced to a negligible value by using the average secured from the large number of peaks generally available. In general, as many of the peaks as possible should be used in determining an average difference (d) because some variation in the difference of frequency between successive peaks has been found to exist. It will be noted that the attached charts provide examples in which distortion is present. One means of minimizing this background of interference would be to provide a square-law characteristic in the rectifier for the graphic milliammeter instead of the linear characteristics now in use, and thereby produce a suppressing effect on the interference and at the same time tend to exaggerate the fundamental peaks desired. Another means of minimizing such distortion would be to terminate the far end of the line with a non-inductive resistor equal to the surge impedance of the line.

Limitations of Method—The apparatus installed at Holtwood has the following limitations:

1. When the fault is very close to the station two peaks may not appear on the record, which means that the fault is within a certain known distance from the station. For the oscillator frequency used at Holtwood this distance would not exceed 1.9 miles.

2. Theoretically, if a conductor is terminated in an impedance equal to its surge impedance, the current impulses will be absorbed and there will be no reflection and no change of circuit impedance with a change in frequency. Such a condition may by chance result on a circuit without overhead ground wire where the conductor falls on a tower having a footing resistance equal to the surge impedance. Recent tests have confirmed this theory. It is believed, however, that a case such as the above would be a remote possibility.

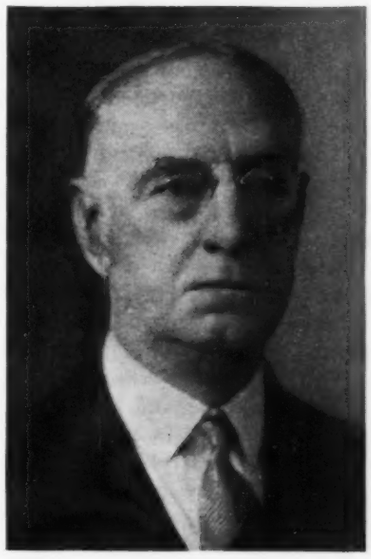
3. On a circuit having taps or branches confusing graphs may result from reflections from the tap terminations. It may be necessary in such instances to sectionalize the circuit before testing for fault location.

4. If there is a double fault on the same conductor, only the one nearest the testing end can be located.

Conclusions—The ability of the test method and routine to locate transmission line faults has been demonstrated by actual field trials on the 70-kv., 40-mile Holtwood-Baltimore lines in which the nature and location of the faults were unknown to the testing personnel. The faults were of a nature designed to simulate, as far as possible, probable mechanical failures resulting from wet snow and sleet, and included such conditions as a broken conductor lying on the earth clear of the tower, a broken conductor touching the tower, a broken conductor in contact with another phase, a broken conductor clear of both tower and ground, and two conductors in contact with a ground. These conditions were combined into four different tests, one of which had faults at two locations along the line on different conductors. Each of the three other tests had faults at three different locations and involved more than one conductor on the same tower. The locations varied between 7.5 and 38 miles from the station.

Each of the faults was successfully located within an accuracy of 2 per cent in less than ½ hour. The apparatus in use at the time consisted of experimental home-made equipment with an oscillator frequency range from 0 to 60,000 cycles, and the charts were drawn manually by following an indicating ammeter. Since then the equipment illustrated (General Radio Company) has been installed permanently at Holtwood, and it is believed that the improved frequency stability and higher frequency range will permit fault location to be made with an accuracy much better than 2 per cent.

Punitive Taxation Dries Up Sources



No citizen, whether person or corporation, can in good citizenship complain at bearing a full share of the cost of the proper functions of government, which in these days must extend to unprecedented measures for alleviating economic and individual distress. But to single out the utility companies for special and exceptional taxation merely because it is politically safe to impose upon them is unfair. It becomes ironical when the proceeds of excessive taxation are poured by the hundreds of millions into useless and extravagant projects which produce no taxes and less employment per dollar expended than any other kind of undertaking, and which, when put into operation under the tyrannous and destructive form of management already evidenced by the T.V.A. will tend to dry up a source of revenue which was commandeered to create them.

Stockholders in utility enterprises everywhere will display not merely self-interest but a regard for true national welfare by protesting.

C. O. G. MILLER,
President
Pacific Lighting Corporation.

Include Electricity in Rents

Slum-Clearance Housing Projects Provide for Inclusion of Electric Kitchens in Modern Tenement Developments and Purchase of Energy for Group at Wholesale

By R. R. SMITH
Assistant Chief Plans and Specifications
Federal Emergency Administration
of Public Works

THE primary function of the Housing Division of the Federal Emergency Administration of Public Works, through its slum elimination work, is the construction of modern, fireproof, one- to three-story row houses, flats or apartment units, with ample light, cross ventilation, sanitation and facilities for refrigeration, cooking and heating at low rentals.

Depending on each city's requirements, projects are erected to take care of from 100 to 4,000 families with necessary playground areas, community centers, group laundries, stores, etc. With an average of 25 per cent land coverage, and from five to 50 buildings erected in accordance with each project's individual requirements, from four to twenty city blocks may be acquired for the site, all of which present problems of distribution for gas, electricity, water and sewerage, similar to those involved in the laying out and erection of a new city on a smaller scale.

In order to obtain low rentals, all utilities services must, wherever possible, be purchased wholesale. Otherwise, the furnishing of equipment and the costs of lighting, refrigeration, cooking, heating and hot water equipment would be prohibitive as compared with the makeshift equipment the tenants now use for similar purposes in the slum or tenement areas.

The majority of slum tenants the country over are minimum-bill customers for electricity at 75 cents per month, paying a deposit fee of from $2.50 to $5, which is non-profitable business for the utility. Using an average of 25 kw.-hr. at 5.5 cents per kilowatt-hour retail, their average lighting bill would total $1.37 per month. By purchasing electric energy wholesale we can proportion 40 kw.-hr. per month to the tenant at 1 cent per kilowatt-hour, totaling 40 cents per month, or a saving of 35 cents under the minimum bill and a saving of 97 cents under the cost for 25 kw.-hr. retail. At the same time we permit the use of 60 per cent more current, have more satisfied tenants, and decrease vacancies.

For refrigeration, investigation has shown that the average slum tenant uses 10 cents worth of ice 120 days per year, totaling $12 per year. By comparison, a 4-cu.ft. electric refrigerator, averaging 10 kw.-hr. per cubic foot capacity, or 40 kw.-hr. per month, operating on wholesale electricity at 1 cent per kilowatt-hour, costs the tenant 40 cents per month for complete refrigeration 365 days per year, showing a saving of 60 cents per month. And by adding electric refrigeration, kilowatt-hour costs are reduced for apartment lighting and power requirements, although this saving has not been considered in this comparison.

Average cost per slum tenant for gas cooking has been found to be $1.50 per month, with a $2.50 or $5 deposit required. Average cost for coal for a coal range is $1.25 per month. Assuming electric ranges use an average of 125 kw.-hr. per month, the electric cooking will cost $1.25 per month at 1 cent per kilowatt-hour. This compares favorably with the average cost of operating gas or coal ranges, and the lighting and refrigeration costs will be reduced proportion-

ately by adding this increased electric cooking load.

These figures are based, of course, on fuel costs alone, all other items, such as sinking fund, repairs, wages and capital costs, being disregarded for the moment, although generally the savings in fuel costs alone overbalance the increased investment required for an all-electric installation. Summing up the above comparative fuel costs we have the following figures:

Retail		Wholesale	
Apt. lighting—25 kw.-hr. at 5.5 cents	$1.37	40 kw.-hr. at 1 cent	$0.40
Apt. refrigeration ice	1.00	40 kw.-hr. at 1 cent	0.40
Apt. coal range	1.25	125 kw.-hr. at 1 cent	1.25
General building requirements 50 kw.-hr. or 3 cents per apartment per month	1.50	50 kw.-hr. at 1 cent	0.50
	$5.12		$2.55

This shows an average saving of $2.57 per tenant per month for bare fuel for an all-electric project with all costs included in the rent, giving 60 per cent more current for lighting purposes, and refrigeration 365 days, as against 120 days for ice box refrigeration. These figures are based on an average 3½-room apartment with two adults and two children.

Situation on the Georgian project

For an actual comparison in relative lighting, refrigeration and cooking costs, let us take the Techwood housing project, now under construction in Atlanta, Ga., assuming that electric lights, ice boxes and gas ranges will be used with energy and fuel being paid for at retail by the tenants, as against an all-electric installation with energy purchased wholesale for lighting, refrigeration and cooking. The project consists of 603 apartments, 2,128 rooms, or a room ratio of 3.53 rooms per apartment. Steam is purchased wholesale from the Georgia Power Company for heating and hot water requirements. Electricity is purchased wholesale on the "Wholesale Municipal Service Schedule Rate C-5, Class C," where the consumption is more than 600,000 kw.-hr. per year with a minimum monthly bill of $844.44 and a 10 per cent discount for prompt payment.

Applying the Georgia Power Company retail residential service inducement rate (Schedule A-3) 25 kw.-hr. will cost $1.61 per month for lighting, or an average of $0.064 per kw.-hr.

Using the Atlanta Gas Light Company domestic gas service rate schedule No. 1 for 995 B.t.u. gas and assuming 800 cu.ft. consumption per month for tenant cooking, the cost will be $1.04 plus a 65-cent service charge, totaling $1.69 per month.

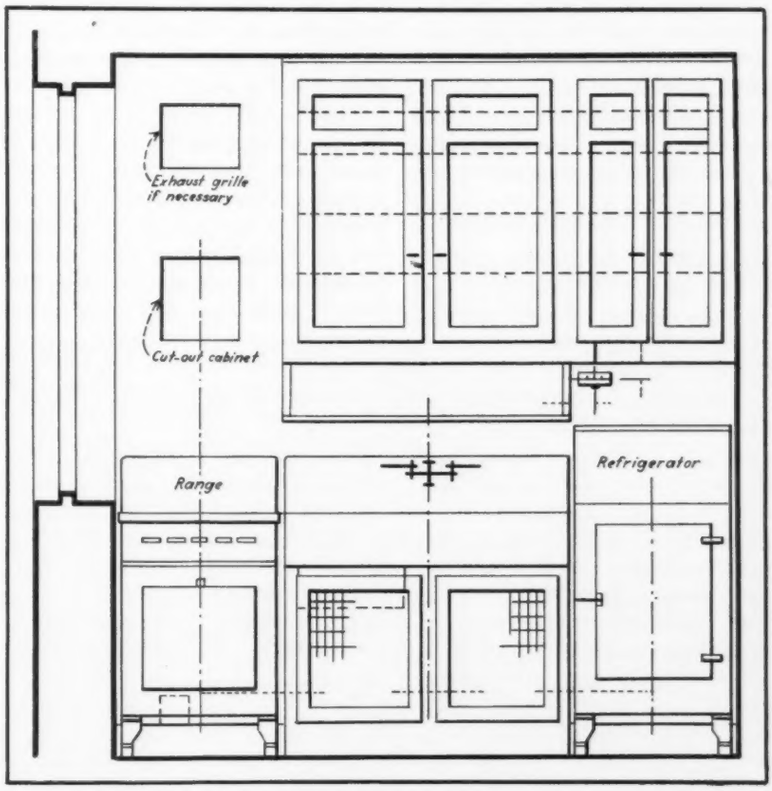
Applying Georgia Power Company's wholesale municipal rate (C-5, Class C) we obtain an average cost of $0.0113 per kw.-hr. using the following: 40 kw.-hr. per apartment for lighting, 40 kw.-hr. for apartment refrigeration, 125 kw.-hr. for apartment cooking and 50 kw.-hr. per apartment for general building requirements, totaling 255 kw-hr. per apartment per month. Multiplied by 603 apartments, this amounts to 153,765 kw.-hr., costing net $1,735.40 per month.

Retail		Wholesale	
Apt. lighting 25 kw.-hr.	$1.61	40 kw.-hr. at $0.0113	$0.452
Apt. refrigeration ice	1.00	40 kw.-hr. at $0.0113	0.452
Apt. cooking gas	1.69	125 kw.-hr. at $0.0113	1.412
Project per apartment at $0.033	1.65	50 kw.-hr. at $0.0113	0.565
	$5.95		$2.88

Here is a total fuel saving of $3.07 per apartment or tenant per month by purchasing electric energy wholesale. Gas in this instance costs the same wholesale as retail for cooking.

In order completely to electrify a project the initial cost of distribution system and substation and refrigerator and range to be proportioned in the cost is more by approximately $90 for each apartment than it would be were gas range and ice box used. The capital costs, taxes and vacancy charges based against this additional $90 investment total $0.28 per apartment per month. The sinking fund, major and minor repairs and wages based on this additional investment of $90 approximate $0.68 per apartment per month. Adding these costs to the $2.88 fuel costs, we find a total of $3.84 per apartment per month, as against $5.95, or an actual saving of $2.11 per apartment per month for an all-electric project. In view of the fact that the total sinking fund, major and minor repairs, wages, capital costs and other fixed charges would remain proportionately the same on the total investment for each set-up, these have only been used for the additional investment as a matter of simplification in this cost analysis.

In many cities the gas company has extended wholesale gas purchase rates that are materially less than the Atlanta rates. Typical of these reduced rates are 18 to 60 cents for 1,000 cu.ft. of 1,100 B.t.u. natural gas and 30 to 85 cents for 1,000 cu.ft. of 550 B.t.u. manufactured gas. Where such rates



One of several kitchen layouts proposed for housing projects
The housing division has developed a series of standard layouts for apartments erected under slum-clearance projects.

are extended for gas, electricity has to be purchased at from 5 to 8 mills to compete favorably.

The Housing Division does not use increment energy costs for either refrigeration or cooking in its cost analysis. The combined kilowatt demand and kilowatt-hour costs are added as a unit by dividing the total kilowatt-hours consumed per month into the total electric bill; the average kilowatt-hour cost obtained is applied to all purposes—lighting, refrigeration and cooking and general building requirements. The average wholesale rates extended by all the electric utility companies in all cities is approximately 9 mills per kilowatt-hour, including kilowatt demand costs.

In the purchase of wholesale electric energy for housing purposes throughout the country, each city and each utility presents a different problem. The majority of purchases on slum-clearance housing projects are being made through one master primary meter, with energy delivered and metered at 19,500, 13,500, 4,000 or 2,300 volts, and in several instances at secondary voltages. Some utilities furnish the first step-down transformer equipment to distribution voltages. Others deliver at distribution voltages and the project furnishes the primary and secondary distribution systems and maintains these at its own expense. Others furnish primary and secondary systems complete and maintain them, while others furnish and maintain the transformers only—the project furnishing the balance.

Effect on other customers

In approaching the average electric or gas utilities for wholesale purchase business, the first and natural reaction is that if the Housing Division gets a wholesale or special rate filed all other customers will expect similar rates or reductions. This objection is not serious, as minimum monthly bills or minimum kilowatt demands or kilowatt-hour consumptions can be established which would not upset any present customer billing to any marked degree. If other customers can earn such rates, then complete electrification would reflect itself favorably on other similar or smaller enterprises, stimulate electric appliance sales and eventually increase the utility load and profit. By the same token, wholesale gas rates permitting gas refrigeration, cooking, hot water and heat would in turn stimulate similar business in that respective locality.

Complete electrification with modern equipment in the lowest rental apartment housing project in each community will automatically set up new standards for the present or future apartments catering to the higher income tenant. Complete gas-equipped projects (excepting lighting) will likewise reflect themselves in the community in a similar manner. Wide-awake progressive electric and gas utilities are aware of this fact and are co-operating with the Housing Division to the fullest extent, especially where one utility does not own and operate both electric and gas businesses.

The Housing Division, in its efforts to furnish modern up-to-date equipment operated at less cost to the tenants than old obsolete equipment, hopes to stimulate the manufacturer of electric or gas refrigerators and electric or gas ranges to a marked degree and will indirectly set up an entirely new standard of living in three-quarters of the cities in which its projects will be erected. Furthermore, by the use of modern equipment operated economically, obsolescence will be reduced to a minimum, vacancies will be cut from the usual 15 or 10 per cent to less than 5 per cent and happier and more satisfied tenants will replace the usual disgruntled ones paying high rents for obsolete, antiquated living quarters.

The Housing Division, by standardizing on high-efficiency, low-maintenance and low-energy-consumption electric or gas refrigerators and ranges and by buying these in large quantities in the off-peak months, makes it possible for the manufacturers to gain large production and sell at correspondingly reduced costs.

Excess usage may not justify individual metering

The question of submetering electric energy or gas to the tenants where the housing project purchases wholesale through one meter is a problem easily solved to the satisfaction of all concerned. Meter loops are being provided for all apartments in all projects. These are used for checking purposes. That is, a meter may be installed for checking consumption. If the tenant uses in excess of the allotted amount included in his rent, he may have his rent increased proportionately, or if he uses less, have his rent reduced proportionately. In all cases where the utility objects, or the state or city laws prohibit, individual tenant meters will not be installed, but check meters will still be used at stated intervals unknown to the tenants. The problem of remetering depends solely on the type of rate extended by the utility. As an example, if the kilowatt demand for a fully-electrified apartment is 1 kw. and the kilowatt-hours included in the rent per month are 255 per apartment and the scheduled rate sells excess energy over and above a stated amount at an average of 5 mills per kilowatt-hour, no tenant submeters would be considered, since to furnish, install and maintain them, read, and bill the customer, the average cost would be 30 cents per statement. With the kilowatt demand and the kilowatt-hour costs included in the rent it is only natural to assume that excess kilowatt-hours consumed over and above these amounts would be off the peak demand and would cost 5 mills per kilowatt-hour. Assuming, therefore, that the refrigeration consumption would remain fairly constant and that the tenant would use 60 more kilowatt-hours per month than allotted him for lighting and cooking, at 5 mills it would only cost 30 cents, or the same amount involved for individual tenant metering and billing. With a diversity of from 300 to 3,000 tenants, it is fair to assume that such excess waste would not occur. Assuming that it did, this excess would in turn lower the over-all kilowatt-hour costs for the total month for all purposes and the increased cost would actually be less than 30 cents per tenant.

Actual demand and kilowatt-hour consumptions have been checked very closely on a fully electrified housing project now in operation (without elevators) and the findings were most satisfactory. For 135 rented apartments, including all apartment and project requirements on unmetered energy included in the rent, the demand per apartment was 730 watts and the kilowatt-hour consumption per month was 185 for all purposes, with use unlimited. These basic quantities, if used as a minimum for the Techwood housing project, would reduce the consumption 70 kw.-hr. per month, valued at 79 cents. Until similar data are available in other sections of the country the Housing Division hesitates, however, to use such minimum consumption figures.

Electricity Cuts Molding Costs

Small Amount of Steam Needed for Molding Bakelite Was Expensive When Large Boiler Plant Had to Be Operated to Supply It

By JAMES B. HOLSTON
Wagner Electric Corporation,
St. Louis, Mo.

A SAVING of $2,400 a year is being realized in the bakelite molding department of the Wagner Electric Corporation by the use of four 10-kw. electric steam boilers. The boiler plant of the building in which the department is located contained two units, one for building heating and the other for four molding presses. Both were oil fired. The process-steam unit represented approximately 5 per cent of the total steam requirements. In the summer months an attendant was necessary as well as in winter, although his duties were of course very light during the months when no heat was needed.

It was pointed out by engineers of the Union Electric Light & Power Company that the installation of electric steam boilers to provide for the process steam would result in real economies. In the first place an attendant would not be needed in the summer months. Furthermore, generation of the relatively small amount of steam needed could be accomplished at a lower cost using electric boilers instead of the oil-fired type.

One 10-kw. boiler was installed earlier in 1933 on one press. A test made on this unit to get actual operating cost figures showed that one hour was required to get up 120 lb. pressure. The average first hour consumption on five days was 11.448 kw.-hr. The average of all succeeding hours of operating during five days was 6.834 kw.-hr. (excluding one two-hour shutdown).

Since four boilers are needed—one for each press (all have subsequently been installed)—the operating figures below are based on the actual tests on the one boiler multiplied by four to get total consumption figures.

There might be some variation in the demand charge from the figures given. If the plant demand were not increased because of the use of the electric boilers the demand charge against the boilers would decrease from the figures used. Furthermore, use of the oil-fired boiler in the winter months instead of the electric boilers would eliminate the demand charge against the electric boilers during this time.

Cost data on the oil-fired boiler for 86 hours operation in 1933 of one press showed 1,380 gal. of oil costing $42.86 and $42 for labor totaling $84.86; estimating twice this amount of oil to operate all four presses the oil cost for 225 hours (one month) would be $224; 225 hours of labor would cost $110. Thus, the total cost of steam from the oil-fired boiler operating four presses one month would be $334.

A summary of the situation is given below:

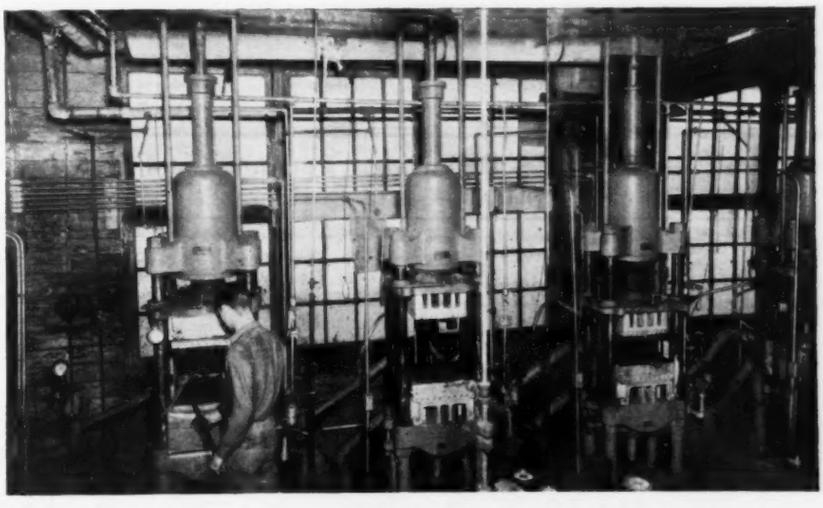
Cost of steam—oil-fired boiler—(one month)	$334.00
Cost of steam—four electric boilers—(one month)	78.69
Gross saving per month using electric boilers	$255.31
Gross saving per year using electric boilers	$3063.72
Deduct cost of labor during heating season	660.00
Net yearly saving in favor of electric boilers	$2,403.72

Operation of these four electric boilers for approximately two years has been quite satisfactory. The convenience of having an individual boiler for each press is worth while, since the possibility of a complete shutdown because of boiler trouble is practically eliminated. Convenience and economy in extra shift and overtime work result, since no boiler attendant is needed. These points, together with the actual saving in operating cost, justify the installation.

Composite Performance of Four Electric Boilers

Based on one month of 225 operating hours

Starting period: 25 hours × 44. kw.	=	1,100 kw.-hr.
Running period: 200 hours × 27.2 kw.	=	5,440 kw.-hr.
Total		6,540 kw.-hr.
Diversity factor: 0.7		
Demand charge 40 kw. × 0.7 × $1.25	=	$35.00
Energy charge 6,540 kw.-hr. × 6.68 mills	=	43.69
Total estimated monthly cost of four 10-kw. boilers		$78.69



Four bakelite presses served by electric boilers at left of each unit

Selling in Alabama

Alabama Power Company Embarks Upon a Business-Building Program—Sells $15.30 of Appliances per Customer—Adds Business for 29 Cents per Dollar of Revenue

By L. W. W. MORROW
Editor

This is the third of a series of articles dealing with the astonishing sales efforts of the Commonwealth & Southern properties in the South. Based upon a common study and program, these properties have gone after business on an unprecedented scale. This is a report of operations of last year and shows the costs and returns of accelerated sales operations. An analysis of these sales programs should be of great value to the industry.

THE Alabama Power Company is facing the future courageously and is striving to overcome threats to its existence by actively and aggressively selling its energy at low rates and by giving service to its customers of the highest quality. It is in the midst of the T.V.A. situation and knows that its best hope lies in building business and customer good will through giving abundant service at very low rates. As a consequence the entire company is busy in the marketplace and is stressing business getting as never before.

This system serves nearly all the state of Alabama except the city of Birmingham and has always been in the front rank of utilities in commercial efforts. It has led in industrial developments, in promotional rates and in merchandising. Yet present necessities made it advisable to expand and speed up the sales program greatly. The data and results are those of only a few months, but they are indicative of where the company is headed this year.

The basic program for commercial effort is the same as that outlined for Tennessee and Georgia and involves the use of every possible company and outside agency to build business and to keep the business sold.

Until recently dealers did little business with major appliances, but the advent of the refrigerator built up the dealers, and although no dealers handled water heaters and ranges in 1933, a co-operative plan was put into action to get 350 refrigerator dealers to take on these devices and steady progress is being made in the development of dealer sales. The company does wiring for all sales of ranges and water heaters for dealers as well as its own sales. Research and marketing specialists are afforded dealers and at the end of last year some 150 dealers were handling water heaters and ranges as well as the 75 stores of the utility. The utility finds that dealer sales mount as its sales mount and good co-operation exists in sales efforts.

In 1933 the utility made a study of meter-route records to find the appliances in use and equipment not in use in the various homes. It evaluated these conditions and found domestic revenue was short about $186,000 due to non-use of appliances sold. It set up the correction of these conditions and in the early part of 1934 five men and a foreman were put to work as a floating appliance repair crew. These were informed and trained men, several of them technical graduates. The total cost of this crew, including cost of material used, salaries and expenses, was less than $1,300 per month, while the revenue from this source averaged $3,500 per month. It was found that these men secured $2.75 of business for each $1 of cost, and later the program was enlarged.

There were no charges made to the customers for labor and an allowance of $1.50 was made for material at each home, when necessary. These men created favorable customer reaction. A spot-survey during the year showed just about half as much loss in revenue as was found in previous years.

This work supplements that of the home economists, who use as much of

Table I—New-Business Cost and Revenue

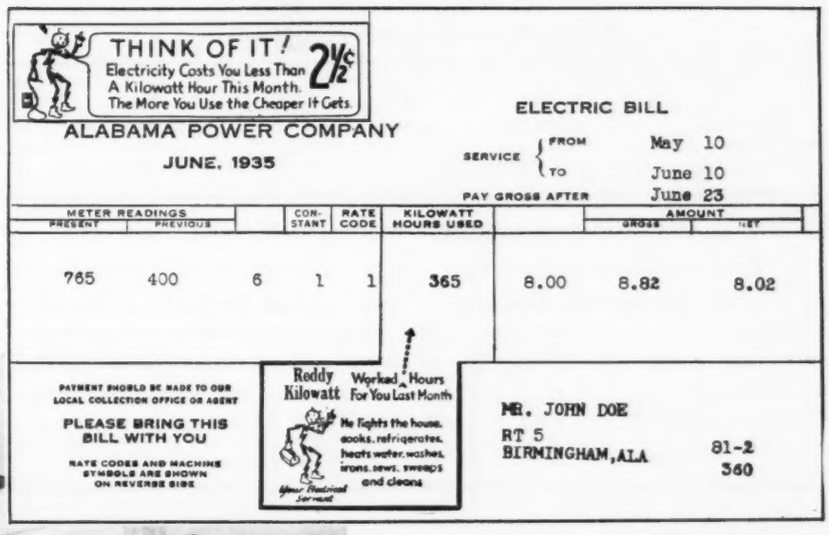
Year	New Bus. Exp.	Mdse. Profit	Total Expense	New Rev. Added	Exp. per $ of Add. Revenue
1932	$309,527	$78,134	$387,661	$790,288	49 cents
1933	343,658	8,260	335,398	833,175	40 cents
1934	464,597	80,362	384,235	1,322,217	29 cents

Table II—Total Sales Department Personnel and Expense For All Classes of Business

Classification	Actual 1932		Actual 1933		Actual 1934		Budget—1935	
	No. Emp.	Gr. Exp.	No. Emp.	Gr. Exp.	No. Emp.	Gr. Exp.	No. Emp.	Gr. Exp.
Management	22	$74,139	22	$73,541	24	$89,138	26	$95,040
Home service	7	15,822	8	16,148	14	29,952	16	33,900
Wiring	..	.....	..	.....	..	.....	..	.....
Advertising	4	112,915	4	135,505	4	152,105	4	178,320
Industrial	..		..		..		1	
Power sales	9	77,591	9	83,092	9	150,547	9	202,080
Res. & com. ltg.	10		17		38		40	
Rural	5		5		5		5	
Merchandising	49	.....	45	.....	48	.....	69	.....
Miscellaneous	..	29,060	..	35,372	..	42,855	..	47,340
Total	106	$309,527	110	$343,658	142	$464,597	170	$556,680

their time as possible in calling upon homes and putting idle appliances to work. This duty absorbs an increasingly large proportion of the time of the home economists, who normally work on demonstration, garden parties, dealer and store group meetings, build prospect lists, as well as create good

Office of Alabama Power Company at Anniston


THINK OF IT! Electricity Costs You Less Than 2½¢ A Kilowatt Hour This Month. The More You Use the Cheaper It Gets.
ALABAMA POWER COMPANY
JUNE, 1935
ELECTRIC BILL
SERVICE FROM May 10
TO June 10
PAY GROSS AFTER June 23
METER READINGS PRESENT 765 PREVIOUS 400
CONSTANT 6
RATE CODE 1
KILOWATT HOURS USED 365
AMOUNT GROSS 8.00 NET 8.02
PAYMENT SHOULD BE MADE TO OUR LOCAL COLLECTION OFFICE OR AGENT
PLEASE BRING THIS BILL WITH YOU
RATE CODES AND MACHINE SYMBOLS ARE SHOWN ON REVERSE SIDE
Reddy Kilowatt Worked Hours For You Last Month
He lights the house, cooks, refrigerates, heats water, washes, irons, sews, sweeps and cleans
MR. JOHN DOE
RT 5
BIRMINGHAM, ALA
81-2
360

Illustrating use of "Reddy Kilowatt," "sticker" (upper left) and pointer

will, and contribute to the electrical education of prospective customers. These girls answer all complaints and in their home service calls and complaint calls carry on a valuable work in building up revenue recovery.

A special department handles all lighting work. This department is divided into three sections, known as home lighting, commercial lighting and industrial lighting. Some indication of the rate of acquisition of new lighting business is found in the following table:

Year	Jobs Sold	Kw.-Hr.	Revenue
1933	13,302	9,600,000	$389,000
1934	33,139	18,500,000	640,000

No fixtures or lighting equipment are sold, but recommendations only are made and the equipment and wiring is handled and sold by especially appointed dealers. In the South, where outdoor living claims such a large proportion of the leisure time of the population, there is found a tremendous increase in lighting of recreational centers, athletic fields, garden and pool lighting by the home owners.

In general sales work the salesmen are paid a commission that increases with the volume of appliances sold plus a bonus on certain appliances. The normal rate is 5 per cent on the first $600 of sales, 6 per cent for the next $600 and 7 per cent for over $1,200 monthly, plus a bonus of $15 for each water heater and $10 for each range. Particular effort is devoted to the low-use customer in the selling of the sales staff and employees. The low-price refrigerator, irons, small water heaters and lamps are found to be best sellers to these customers.

A human interest element in the sales work is the "Hustling Oligarchy of Order Hounds" with its several ranks that are attained only by showing proficiency in selling. This adds a human touch and a competitive element to the sales work that is very

Table III—Record of Merchandise Sales by Company

Year	Total $ Vol. (Gross)	Total Sales per Cust.	No. Refgs.	No. Ranges	No. Water Htrs.	No. Ranges Rented	No. Wtr. Htrs. Rented
1932	$604,103	$8.54	1,383	1,056	333	...	...
1933	623,676	9.23	2,641	607	159	*80	*99
1934	1,119,412	15.23	4,592	1,379	667	103	72
1935 (budget)	1,650,000	21.60	7,320	2,790	1,540	...	...

*Effective Sept. 15, 1933.

Table IV—Growth of Residential Business Only

Year	No. Avg. Customers (Not Inc. Rural)	Total Kw.-Hr. Sold	Kw.-Hr. per Customer	Total Revenue from Kw.-Hr.	Revenue per Cust.	Total Merch. Sales	Sales Per Customer
1929	71,571	40,856,914	571	$2,273,414	$31.76	$1,342,188	$18.72
1930	72,959	50,642,059	694	2,558,396	35.06	1,377,210	18.90
1931	73,824	56,457,693	765	2,743,336	37.16	969,639	13.13
1932	70,720	56,434,357	799	2,705,721	38.25	604,103	8.54
1933	67,516	53,513,196	793	2,474,422	36.65	623,676	9.23
1934	73,411	63,952,314	871	2,454,632	33.44	1,119,412	15.23
1935 (budget)	76,302	75,882,800	995	2,754,800	36.20	1,650,000	21.60

Table VI—Commercial Business

	1931	1932	1933	1934	(Budget) 1935
Gross revenue	$2,786,054	$2,504,887	$2,331,921	$2,370,219	$2,485,000
Kw.-hr. sold	66,779,781	58,599,282	54,820,235	61,053,892	70,193,800
Avg. no. meters	24,682	23,477	22,303	22,478	22,898

Table V—Distribution of Residential Customers (Not Including Rural)

	April, 1932	Sept., 1933	Oct., 1934
	——Per Cent——		
0-15 kw.-hr. per month	28.4	33.3	18.1
15-30 kw.-hr. per month	28.4	24.9	29.6
30-50 kw.-hr. per month	16.0	10.9	15.2
Over 50 kw.-hr. per month	27.2	30.9	37.1

Table VII—Distribution of Commercial Customers (Not Including Rural)

	——Per Cent——			
	1931	1932	1933	Oct., 1934
0-15 kw.-hr. per month				25.3
15-50 kw.-hr. per month	Not available			23.8
Over 50 kw.-hr. per month				50.9

Table VIII—Objective Rate of Alabama Power Company

$1.00 net for first 15 kw.-hr. per month; plus
4.5 cents per kw.-hr. for next 50 per month; plus
2.0 cents per kw.-hr. for next 135 per month; plus
1.25 cents per kw.-hr. for next 500 per month; plus
1.00 cent per kw.-hr. for all in excess of above
Minimum charge per month, $1.00

popular with employees and creates sales enthusiasm.

The finite results of the selling of this company are shown in the accompanying tables. Also the man-power, the costs and the returns. The work has gone on successfully and at a continually increased rate because of the enthusiasm back of the selling effort and the co-operation of all in the company. While the balance sheet for the entire company operations shows it is not yet in the realm of prosperity, it should be noted that the trend is in the right direction and that this sales effort is the only chance to offset the drastic decrease in revenues that came from rate cuts and the effect of the depression.

While the budget or bogey figures as given for this year are an advance on those of last year, last reports show that they are being exceeded. Here, as in other localities, results exceed expectations and there is a continual necessity to enlarge the program.

It should be evident from the data and the story that low rates of themselves do not get business at the rate desired. It takes an enthusiastic sales organization and the co-operation of all in the company, well supported by advertising and man-power. It also takes close attention to existing customers and their equipment.

The company believes its sales program is getting results and permitted the release of the detail data shown. This is but the start of the effort and further data will be awaited with great interest. They are working hard and are confident of the ultimate results.

Municipal Operator Advises R.E.A. to Return Its Appropriation

The Rural Electrification Administration has solicited advice as to how best to spend the $100,000,000 rural electrification fund. As recorded by the *Wall Street Journal*, the manager of the Gas and Electric Department of the city of Holyoke, Mass., volunteered the following suggestions:

Mr. Morris L. Cooke,
Rural Electrification Administrator,
Washington, D. C.

Dear Mr. Cooke: Yours of May 15, R. E. 34016, is at hand.

I am delighted to know that a man of your ability and capacity for public service has been appointed to the position of Rural Electrification Administrator. Although I have little or no sympathy with rural electrification, as an economic measure, I sincerely congratulate you upon your appointment and I hope your efforts will be successful.

My limited experience, covering 22 years as manager of a municipal plant and consulting engineer for several cities and towns, has taught me that rural electrification seldom pays a return on the investment. I know of several rural installations where the return is insufficient to pay maintenance cost of the pole lines. That is why I have little or no sympathy with rural electrification.

Your letter states that you are asking the men with whom you have been associated in power matters for the past 25 years to make suggestions as to how the Rural Electrification Administration "can render the greatest public service." I think that is the easiest question to answer that has been put up to me in the past 22 years. Undoubtedly you will disagree with my answer, but here it is. You can render the greatest public service by turning the entire appropriation (reported to be $100,000,000) back to the government with the advice that the expenditure of such a sum for such a purpose would be economically unwise and unsound.

You disagree. I expected you would. The T.V.A. would probably disagree should I say that the cost of distributing electrical energy, to say nothing about the cost of generation and transmission, is more than the prices the T.V.A. offer to sell electricity for in their published schedule of rates. But it is true, nevertheless. You know it is true, I know it is true, and so does anyone who has sold electricity and studied distribution costs. Everybody knows it but the government. But perhaps the government does not consider costs.

I presume those in charge of the "Quoddy" project in Maine approve of the expenditure of 30 to 40 million dollars to harness the tides notwithstanding that the project has been pronounced economically unsound by government engineers who studied it. Maine has more power now than can be sold and there is more undeveloped power in Maine than will ever be utilized. And what about the laws of Maine that prohibit the exportation of power? Are those laws to remain in effect?

I question whether those who are to be served by rural electrification can afford to pay rates that will yield a fair return upon the investment, plus operation and maintenance charges. I doubt that T.V.A. will be able to sell the electrical energy it will be able to generate and distribute. I know there is no market in Maine or the adjacent states for the amount of energy it is said will be generated by the "Quoddy" project. It might possibly be used for melting icebergs.

To be perfectly frank with you, Mr. Cooke, I think that most federal, state and municipal officials have gone "nutty" on electrical affairs.

Should you adopt my suggestion of turning back the money, your name would be placed alongside that of the "Immortal Lincoln," who said:

"The strongest bond of human sympathy, outside of the family relation, should be one uniting all working people, of all nations, and tongues, and kindreds. Nor should this lead us to a war upon property, or the owners of property. Property is the fruit of labor; property is desirable; is a positive good in the world. That some should be rich shows that others may become rich and, hence, is just encouragement to industry and enterprise. Let not him who is houseless pull down the house of another, but let him labor diligently and build one for himself, thus, by example, assuring that his own shall be safe from violence when built."

That quotation should be on the desk of every public official. If that be treason, make the most of it.

Yours very truly,
John J. Kirkpatrick.

Breakers, Voltage Recovery

Supplementary Discussion of A.I.E.E. Convention Emphasizes Time Required for Recovery as Well as Rate of Progress

DISCUSSION about the margin of circuit breaker rating arose in the A.I.E.E. protective devices session. E. J. Poitras, H. P. Kuehni and W. F. Skeats had said in their paper on voltage recovery tests of the 15-kv. breakers in Richmond station, Philadelphia, that "the breaker appears capable of performing satisfactorily under the worst recovery voltage rate condition likely to be encountered on the system." Differing a bit, B. E. Hagy (Philadelphia Electric Company) pointed out it was not possible to make a system set-up capable of creating short circuit equal to the breaker rating nor even approach the value calculated for the set-up available. The measured short-circuit current with highest recovery rate was above one-third the breaker rating. Analysis of the oscillograms showed that the maximum current interrupted at any time was only 60 per cent of the calculated values or 40 per cent of the interrupting rating.

To Hagy it was clear that our methods of calculating short-circuit currents lack reliability, especially when the point investigated is close to the terminals of generators with cylindrical rotors. Pending the perfection of these calculations it may probably be that interrupting ratings of the more important and larger switching equipment and the mechanical design of bus structures have been placed on a plane unnecessarily conservative and expensive. As for voltage recovery rate, the major theme of discussion at the session, Hagy said it appeared that the agreement between calculated and measured figures is good when advantage is taken of data embodied in the oscillograms, which, however, cannot be determined with accuracy in advance of the tests. In fact, it was concluded that the performance of the Richmond breakers was unaffected by changes in the recovery voltage rate over quite a range, although this factor was important in determining the design.

Joseph Slepian wrote in that it is not important to know whether the recovery rate is 2,500 or 5,000 volts per microsecond, but it is important to know whether the maximum circuit recovery voltage is reached in 200 or in 100 microseconds. He believed the arc space begins to develop dielectric strength several hundred microseconds before current zero. On this basis the race between recovery of dielectric strength of the arc space and the recovery of circuit voltage is not a race from scratch, but one in which the arc space has a start of several hundred microseconds.

System surveys advocated

That we do not know all we should about correlation between interrupting ratings and voltage recovery rates was further indicated by the suggestion of H. P. St. Clair (American Gas & Electric) that surveys of various types of systems be made to determine this factor. He felt it could be undertaken without fear that it would disclose any great number of breakers to be theoretically inadequate; in fact, he left a contrary impression.

W. F. Skeats, one of the "recovery voltage" authors, replied to Hagy that failure to test at higher currents leaves no doubt in his mind about field performance, because he feels that more current would increase the pressures in the Richmond oil blast breakers and enhance the effectiveness of operation. To Slepian, Skeats gave the reply that voltage peaks below 80 per cent of recovery voltage are to be neglected in the proposed A.I.E.E. standards and this will rule out the instances to which Slepian objects. E. W. Boehne (General Electric), who presented an analytical determination of recovery rate, urged that the matter be looked upon as the determination of the rate which the system characteristics set up and not view the breaker as being designed to restrain high rates of voltage recovery.

In presenting his paper discussing the revolutionary impulse breakers for the Boulder Dam system, D. C. Prince said he was not quite sure whether they were the dinosaurs or were destined to make all others look like dinosaurs, so large a step had been taken in their conception and design. Answering P. H. Adams' comment (P.S.E.& G.Co., Newark) about need for further reduction of fire hazard, Prince pointed out that the Boulder breakers have 35 gal. of oil per chamber instead of the total of 23,000 gal. of oil that conventional design would have demanded. Not only did this greatly reduce the fire hazard, but it made it an easy matter to discard the small quantity of oil if it became deteriorated from concentrated arcings. Slepian in written comment had pointed, on the other hand, to the dilutive benefits of large quantities of oil.

Boulder breakers and lines

A feature of one session on Friday was the discussion of the Boulder Dam project and high-voltage lines in papers presented by E. F. Scattergood.

In discussing the papers, D. C. Prince pointed out that the circuit breakers were very important in the operation of the line. With a switching time of 0.2 second as originally contemplated the power to a fault is 225,000 kv. Using 8-cycle breakers with one second relay time the power to a fault is raised to 260,000. Using 3-cycle breakers with high-speed relays giving 0.06 second operating time the power limit is raised another 17 per cent. The breakers thus associate themselves with the generators and transformers to contribute to the total power that can be transmitted.

R. D. Evans said the undertaking represented one of the most severe stability problems encountered and the use of high-speed fault clearing is the outstanding application of this method for improving system operation. He said it would usually be more satisfactory to compute power limits directly for double line-to-ground fault, the criterion for maintaining stability, rather than to use the method given in the paper.

New Rural Underground Cable

Consumers Power Uses 2,400-Volt, Paper-Insulated, Copper-Sheathed Cable to Serve 23 Rural Customers

By F. L. AIME
Electrical Engineer
Anaconda Wire & Cable Company

A NEW type, cable,* paper insulated, copper sheathed, for rural underground electrification has recently been placed in service. This cable ("Coprsheath"), the first of its kind to be installed, was developed at the suggestion of the Commonwealth & Southern Corporation and 3.25 miles of line was installed by the Consumers Power Company near Battle Creek, Mich.

During the past few years engineers responsible for the design of rural lines have been greatly concerned with the added responsibility of the operating company for their maintenance and operation. Increased mileage, under all weather conditions, requires serious consideration of these two items. The relation to them of any new design of line should be studied carefully. For this reason the possibility of underground construction, with its freedom from tree interference, and the like, has always been very appealing, although until recently estimates generally have shown the first cost of such construction to be prohibitive.

Very recent developments in cable design have produced a single-phase cable which appears adequately to meet the requirements necessary for an underground rural line, namely:

1. The cost of the line must be commensurate with that of overhead construction.
2. The cable and accessories must be simple in construction and must permit of easy installation by present available overhead line crews.
3. The use of materials not regularly carried in the company stocks must be kept to a minimum.

Serves 23 rural customers

Early in December, 1934, the Consumers Power Company started the installation of 3.25 miles of rural underground line to serve 23 customers. It is located in Calhoun County, about 30 miles east and south of Battle Creek and extends along an improved gravel highway for 2.65 miles with a branch 0.6 mile along another. The territory represents an average type of farming community in this part of the state. The location was selected mainly because it was where the line had already been arranged for and construction could start immediately, and also because it included various types of soil, varying from heavy muck to clay and stony glacial drift.

The territory in which the line is located is now served by an 11,000-volt, single-phase, 60-cycle, overhead rural line from which customers are supplied through distribution transformers having a ratio of 11,000-120/240 volts. The underground rural line operates at 2,400 volts to ground. To supply it a 15-kva., 11,000-2,400-volt, single-phase, pole-mounted transformer was installed at the point of connection to the overhead line. This installation was made like any other overhead transformer installation, protected by 11,000-volt fuses and lightning arresters in the customary manner. The cable was extended up the pole and terminated with a single-conductor disconnecting type pothead mounted at the end of a four-pin kicker arm. At the pothead connection was made from the underground side of the cable directly to one low-tension terminal of the stepdown transformer. The other terminal was connected directly to the cable sheath and to the ground wire which extends down the pole to ground rods having a low ground resistance. This wire is a common ground, to which also are connected the 11,000-volt lightning arresters and a 2,400-volt arrester installed at the cable pothead. Cable and ground wire are covered with suitable wood molding.

Transformer poles were erected only at customers' premises
Cable trench at base of poles.

Plowed trench installation

The general plan for installing the cable was to plow it into the ground, using a cable plow designed especially for this purpose, the depth varying from 18 to about 24 in., depending upon soil conditions. The cable was laid about 15 to 30 ft. inside the fence line in the farmers' fields.

After the transformer installations were located the actual cutting lengths of the cable were measured. Before reeling out and cutting, the combinations of lengths between transformers which would come closest to utilizing the total amount on a reel (2,800 ft.) were made up, and each reel was marked to show where the cable lengths were to be used, not neces-

*Patent applied for.

sarily continuous along the line. The gang then reeled out and cut as required. In this way the number of splices required and the wastage were kept to a minimum. Only one splice was required. Total cable wasted was 215 ft. (1.18 per cent) of 18,113 ft. reeled out.

At transformer locations a short pole was installed for mounting the transformer and supporting the service wires, which were extended overhead to the customer's house. In reeling out the cable, a sufficient amount was left at transformer locations so that each length could be extended up the pole to the potheads. Pole height depends primarily upon the clearance required for the overhead service wires.

The 23 customers served are so distributed along the line as to require only fifteen distribution transformer installations. No overhead secondary is used, although in some cases one or two poles are required to extend services to grouped customers.

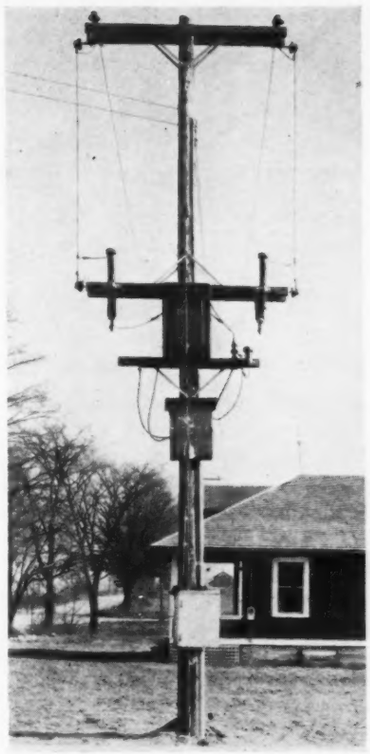
The cable is one of several items designed and available for a complete rural electrification system, all developed into a unified whole. Other items include potheads, joints, methods for installing transformers and other details. The cable is two-conductor, adapted to single-phase operation, with one leg (neutral) grounded. It consists essentially of an inner copper conductor, impregnated-paper insulation, an overlapping of oil- and moisture-impervious tape, shielding tape and a corrugated, impervious, cylindrical copper sheath. Over the sheath is a protective cover of the "Duraseal" type.

Application of the copper sheath has been developed and perfected after about two years of work. The manufacturing process permits of continuous economical operation and assures an impervious copper tube proof against loss of compound from the inside or admission of moisture from the outside. The sheath is corrugated to permit ready bending. The cable is handled in the field very much the same as lead-covered cable.

Paper insulation was selected because of its high dielectric and impulse strength. The copper sheath has obvious advantages of light weight and superior protection against corrosion and electrolysis besides serving as the grounded return conductor.

Outside diameter of cable is 0.775 in.; weight per foot 0.445 lb. The cable is furnished in standard lengths of 2,800 ft. for the sake of economy. Total weight per reel, including reel and lagging, is approximately 1,550 lb.

This is one of three cables made for three nominal operating voltages, namely: 2,400, 4,800 and 7,200 volts to ground, or 3,000, 6,000 and 9,000 volts maximum, respectively.



A stepdown transformer, 11 kv. to 2.4 kv., to supply the underground cable

One leg of the 2.4-kv. winding is grounded.

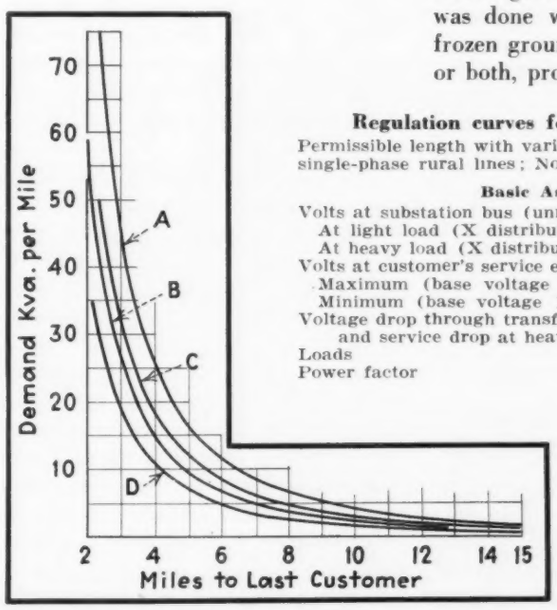
The pothead adapted for use with this cable is merely an outdoor pothead used on lead cable for many years. Wiping is unnecessary. Disconnecting hoods are added for sectionalizing. The joint is housed in a split cast-iron box filled with No. 150 "Superseal" compound. No taping is necessary. The only preparation required, besides joining the inner conductors, is to attach stress cones to the ends of the sheaths, and a copper mesh braid soldered to each sheath to carry the sheath current across the joint.

Other accessories used in this installation include tap connections to the potheads for transformers or branch cable lines, solderless sheath clamps and compound-filled brass thimbles to protect the cut cable ends during construction.

Preparation of right-of-way

Consumers Power Company builds its rural lines on the farmers' property. For this line the right-of-way had already been acquired on the basis of setting poles on the farmers' property, so it was necessary to resign easement papers, with the farmers authorizing the company to install either poles and overhead conductors or underground conduits and cables. This was accomplished without difficulty. The farmers were advised that it would be necessary to remove a section of fence for the tractor and cable plow to pass through. In all cases they agreed to remove and replace these sections at a small unit cost.

Every kind of bad weather was encountered, including mud, sleet and low temperatures, accompanied by frozen ground. Most of the plowing was done with either 2 to 4 in. of frozen ground or 3 to 6 in. of snow, or both, proving it can be done under



Regulation curves for underground cable

Permissible length with various loads per mile; 2,400-volt, single-phase rural lines; No. 6 AWG.

Basic Assumptions

Volts at substation bus (unregulated)
At light load (X distribution transformer ratio) = 123
At heavy load (X distribution transformer ratio) = 117
Volts at customer's service entrance, permissible limits
Maximum (base voltage × 1.07) ..... = 123
Minimum (base voltage × 0.95) ..... = 109
Voltage drop through transformer, secondary (if any) and service drop at heavy load, average ..... = 2%
Loads — Uniformly distributed
Power factor = 0.8

A—No. 6 "Coprsheath" (regulated)
B—No. 6 "Coprsheath" (unregulated)
C—No. 6 Copper overhead line (regulated)
D—No. 6 Copper overhead line (unregulated)

quite unfavorable conditions. Due to this and some inexperience in using the plow, more hand work was necessary than would ordinarily be required. Within the highway limits the cable was covered with a 1½x6-in. plank except where the cable was pulled through a 1¼-in. pipe, which was pushed underneath the traveled portion of the highways. Pipe lengths of 20 ft. were used at each crossing.

The principal equipment required for laying this cable is a line truck, a trailer for handling a cable reel, a tractor of the caterpillar type and the cable plow.

Four crews were organized in small units, each of which had a distinct part of the work to perform, as follows:

1. *Reeling Out the Cable*—This crew consisted of three men who loaded the cable reel on the trailer at the field warehouse, drove to the location, paid the cable off the reel and laid it in a line about 10 ft. to the side of the plowing line. Besides the truck driver, one or two men walked along back of the reel and kept it from jerking the cable or unreeling too much. At each transformer location the cable was cut to allow enough for extending up the pole. A similar allowance was made for the length extending to the next transformer.

2. *Plowing the Cable Into the Ground*—This crew consisted of four men. At the start the cable was threaded through the plow, leaving the extra amount for extending up the pole. One of the crew operated the tractor, one rode on the plow, making adjustments in depth as were necessary; one walked along allowing the cable to pass through his hands and be guided into the plow, and the fourth acted as an extra. Experience showed the fourth man was unnecessary for ordinary conditions.

3. *Hand Trenching of the Cable* — This crew consisted of from three or four or more men, depending mostly upon weather conditions and the number of feet of cable which had to be trenched by hand underneath highways, across certain locations where a tractor cannot pass, under sidewalks and other minor obstructions. The frosty surface did not prevent hand trenching and delayed it very little. On any future job a minimum of hand work is expected.

4. *Making the Transformer Installations* —This crew consisted of a regular five-man overhead line crew, including a foreman, two linemen and two ground men, one of whom is the truck driver. Their job was to set the transformer pole, hang the transformer, install the potheads on the cable ends, train the cables up the pole, make transformer connections and run the service. While the pole is being framed and fitted and the transformer hung, one man installs the potheads on the cable ends and the ground men do what trenching is necessary to lay the cable up to the base of the pole.

Reasons for 2,400 volts

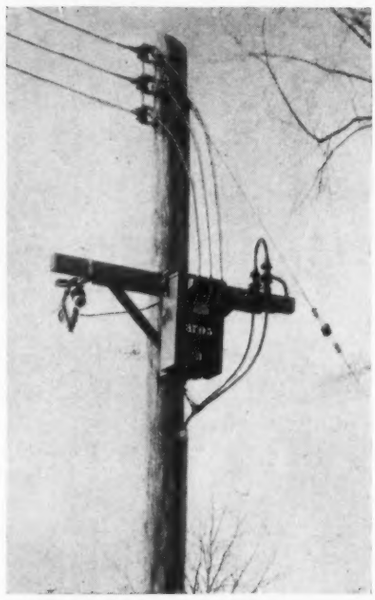
Two thousand four hundred volts was selected for the following reasons, all of which make it a favorable operating voltage for this type of service: First, the cost of transformers and other equipment is a minimum; second, the regulation is entirely satisfactory for the expected demand and length of lines to be served, present and future, from the stepdown transformer. A brief study of the accompanying regulation curves, for regulated circuits, calculated under conditions of service deemed generally suitable for rural lines, shows that this cable at 2,400 volts nominal operating voltage will deliver an average of 10 kva. demand per mile 6.5 miles to the last customer, or 2.0 kva. per mile for 13 miles. Thus, a very wide area even at 2,400 volts can be served. It is reasonable to assume that the length of line on this basis is sufficient to serve customers in practically any area, and that tap points from higher voltage lines can be made at sufficiently close intervals to supply the entire rural districts in a satisfactory manner.

The low impedance of this cable, due to its low reactance, results in No. 6 AWG copper conductor being equivalent on a regulation basis to No. 4 AWG copper overhead open wire line with 5-ft. spacing between wires.

Another factor of advantage in the use of 2,400 volts nominal for underground rural cable is that many companies have a supply of small 2,400-volt transformers in stock, too small to use in urban territory. Rural circuits provide a good opportunity to make use of them.

It is expected that on account of the low reactance of this cable flicker will be reduced considerably on customers' lights during starting of motors on the line, a condition that has caused trouble on overhead rural lines. As yet no opportunity has been available to test this condition.

The cable can be placed in service in sections; that is, as soon as one transformer pole is completed, that transformer can be energized without any interference with work on the next pole or on the cable joining them. This was the method followed.



A three-way tap connection for underground cable branch line
Either branch may be sectionalized by use of sectionalizing potheads.

Applications to rural lines

This cable can be used for laterals or taps from higher voltage lines and appears to be a very satisfactory application. While the capacity of the cable operating single phase at the three voltages mentioned above is adequate for most rural lines, no attempt has been made as yet to consider it as other than for laterals.

A study of the situation before the installation was made in Michigan indicated that, so far as telephone line interference is concerned, the cable can be installed on either side of the road. This advantage also becomes marked in other cases. Thick woods and similar obstructions occur along the line in Michigan, which made it advisable to cross the road and use the other side. Of course, this resulted in cheaper installation of the cable and is a point well worth noting because of the lower cost and greater convenience. Crossing under the roads was found to be inexpensive. As it is now with overhead lines, their location usually is limited to one side of the road only, whether a telephone line is located on the other side or not.

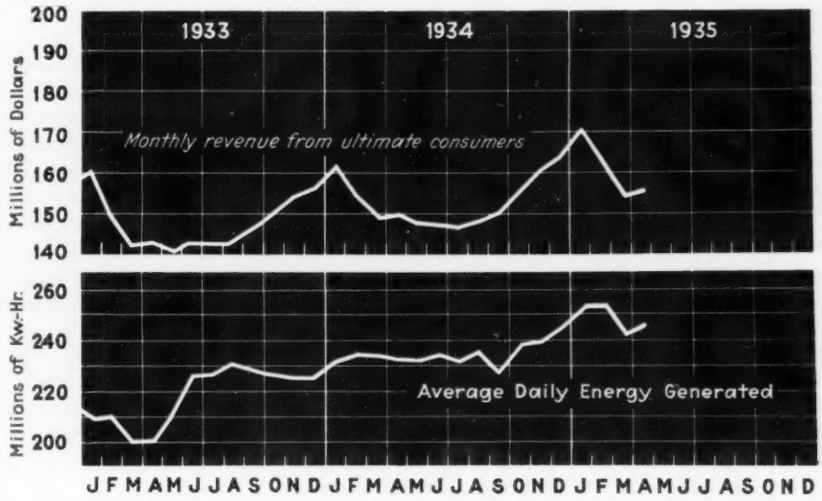
In the case of the Michigan installation, all cables were terminated in potheads at the transformer, which affords a very convenient and ready means of sectionalizing the line in case of trouble or for any other reason. This arrangement also provides an easy way for cutting in each customer or group of customers as fast as they are connected to a transformer. In doing so, work on the cable adjoining the last energized transformer is in no wise interfered with, and the entire operation conforms with safety rules usually set up for line work. This sectionalizing arrangement was found to add to the company's revenue during construction and would be more marked on a bigger job.

Utilities Near 1929 Level

April revenue was 4 per cent higher than a year ago, energy production 5 per cent. Customers increased by 470,000. Domestic rate, still falling, now 5.23 cents.

ENERGY sales for electric light and power continue to be moderately greater than they were a year ago. Revenue from ultimate consumers during April, as announced by the Edison Electric Institute, amounted to $156,069,100 and exceeded the figure for the like month of 1934 by 4.1 per cent. The average gain for the first four months was 4.5 per cent and the rate for each individual month did not vary more than half of 1 per cent from that average. As usual, there has been a decrease from January, but it is a favorable feature that this decrease was smaller than in any other recent year with the exception of 1934. The slight rise in April revenue compared with March is also somewhat exceptional. In most years there has been a decline.

Generated output surpassed that of April, 1934, by 5.3 per cent and the four-month average rose 6.8 per cent. Average daily production was up 2.8 per cent from March. Lessened energy consumption due to the advance of spring, together with such abundance of water power that hydro-electric production rose to 46.5 per cent of the total, combined to permit a great diminution in the demand on thermal plants. The output of the latter was 18 per cent less than in January.


1933
1934
1935
Millions of Dollars
Monthly revenue from ultimate consumers
Millions of Kw-Hr.
Average Daily Energy Generated
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Industrial consumption rises

At last the rise in wholesale energy sales, indicative of accelerated industrial activity, has set in. This class of use normally works up to a pronounced summer maximum. The only exception during the entire depression period was in 1932. This year, after a hesitating advance from the preceding December, the first three months gave no sign of further progress. Sales in April broke over this plateau and rose 12 per cent above December, surpassing last year's April by 6.7 per cent.

Retail commercial sales are almost up to the record for the month, set in 1930. Domestic sales are definitely on a higher level than ever before, taking into account the usual seasonal fluctuations. Rates in the last-named class continue on their downward trend, with an average for the latest twelve-month period of 5.23 cents per kilowatt-hour. Consumption per customer increased 5.4 per cent over the previous similar period to 642 kw.-hr.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1935	Revenue from Ultimate Consumers		Energy-Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent. Inc.
April	156,069†	+4.1	7,368	+ 5.3	3,423	+ 4.2	3,945	+ 6.7
March	155,884	+4.1	7,553	+ 4.0	3,397	+15.8	4,156	—4.1
February	162,470	+4.9	7,057	+ 7.4	2,846	+33.2	4,211	—5.0
January	170,101	+5.0	7,880	+10.0	3,132	+11.0	4,748	+9.0

Table II—Regional Revenue and Energy Output in April, 1935

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	156,069	+4.1	7,368	+ 5.3	3,423	+ 4.2	3,945	+ 6.7
New England	13,038	+0.4	519	+ 5.2	317	+ 2.0	212	+11.3
Middle Atlantic	46,531	+4.7	1,816	+ 4.1	705	+ 1.3	1,111	+ 6.0
East No. Central	36,558	+5.5	1,789	+ 6.5	246	+ 0.8	1,543	+ 7.5
West No. Central	12,887	+3.2	500	+21.2	201	+48.5	299	+ 8.0
South Atlantic	19,605	+4.9	923	+ 3.9	641	+ 5.6	282	+ 0.3
East So. Central			312	+16.0	264	+16.3	48	+14.0
West So. Central	8,214	+3.5	354	+ 8.8	30	— 3.7	324	+10.5
Mountain	4,594	+8.4	253	+13.4	230	+ 9.8	53	+28.5
Pacific	14,642	+2.0	902	— 4.7	819	— 3.3	83	—16.1

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary.

Table III—Allocation of Energy April, 1935

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,382	+ 5.8
Lost in transmission, etc.	1,157	+ 1.8
Sold to ultimate consumers	6,225	+ 6.6
Domestic	1,102	+ 7.4
Com'l, small light and power	1,129	+ 6.5
Com'l, large light and power	3,327	+ 6.7
Municipal street lighting	186	+ 5.6
Railways—street, interurban	365	+ 2.7
Railroads—electrified steam	69	+16.8
Municipal and miscellaneous	47	— 0.5

*Generated, purchased from other sources, imported less energy used in railway and other departments.

NEW DEALERS COVET

Jobs and Dollars of the Industry Lure Those Who Grope for Subsidy for Reform Clique and Their Program

By RAYMOND S. TOMPKINS

IN ALL the excitement of the recent so-called "death sentence" carnivals in Washington a strange new theory about the whole business escaped general public notice. This theory was that the desperation of the government to get hold of the country's public utilities was simply the natural frenzy of men who are drowning to get hold of the biggest and safest-looking life-raft in sight.

The thoughtful observers to whom this theory occurred were startled by its apparent soundness. It explained many things which had seemed inexplicable, the relentlessness, the fury and the far-fetched nature of the attack; the berserk determination to subdue the power and light business no matter who was hurt.

Moreover, the naturalness and logic of the theory seemed beyond dispute. In the present state of the nation there was no reason why all New Dealers should not want to grab the utilities lock, stock and barrel; every reason why they should want to. For without a doubt this industry could be operated in such a way as to support financially a large proportion of almost any program of social reform conceivable to the most helium-headed social reformer. In my town, for example, if the electric light company were run by gentlemen who were using its revenue to help finance New Deal experiments it could pay for (a) sending a third of our unemployed to Matanuska, Alaska, (b) keeping up Townsend-plan pensions for nearly 10,000 of our old folks at $200 a month, (c) building a new government-financed elephant house for our zoo. And if every electric power company in the country were being operated in the same way by the same sorts of men, what limit would there be to the achievements of the New Deal? Practically none whatever. A few cents extra for making your toast in the morning, a few more pennies for using your coffee percolator, your waffle iron, refrigerator, vacuum cleaner and electric fan, and everything would be possible to the Brain Trusters who collected the money, even the goal which many Americans profess to believe prompts the whole current gospel of social reformation, namely, that no man ought to have to work for a living at all.

BUT the immediate promptings of the struggle to grab the utility life-raft were quite different and much more practical, in the opinion of those who hold the life-raft theory. They were simply that if the government could get virtual control of all the electric power business in the country, it could easily and quickly get out of debt. The reasoning of the Washington observers on this point seemed startlingly sound. Here, on the one hand, they said, was the mounting Treasury deficit, the expanding national debt and the swelling torrent of bureaucratic expenditure. Months ago it began to frighten all reasonably thrifty men; today it paled even the cheeks of the New Dealers. And what seemed to be the chances that we would escape from this swamp of debt by any normal taxation which people would stand for? Virtually none. Even the President's new tax program, calculated to shake the money out of the rich, would yield no more than $340,000,000 in 1936, whereas the net deficit for the year would be more than ten times that much.

In contrast stood this American public utility business, strong and sound in spite of shocks that would have wrecked a Goliath. Today it was still employing a quarter of a million people at an average wage of more than $30 a week. It paid out $317,000,000 in wages and salaries. It administered an indispensable and incredibly delicate and complex public service with amazing efficiency. It was able to cough up $240,000,000 in taxes in 1934, when many businesses were wondering where their next bottle of red ink was coming from. During the five depression years it had helped keep government out of bankruptcy to the tune of $1,075,000,000. In 1934 it was able to spend $170,000,000 on improvements and extensions. And after settling up everything it had $688,000,000 left to pay interest to its bondholders, preferred-stock holders and other investors, and to lay something by for surplus and reserves.

IF THERE is anything remarkable about the frenzy of the social reformers to get their hooks on this juicy prize, it is that they were able to restrain themselves so long. Were they blocked by the suspicion that natural human decency would revolt at such piracy? Were they deterred by the fear of violating property rights, flouting the Constitution and offending every American who had a business of his own or a stake in one? Only momentarily.

For there appeared to be a way around these obstacles. There were these "holding companies," and they were vulnerable because some of them had been guilty of misconduct. It was no trick for New Dealers to pin the sins of a few erring holding companies onto all the good ones, and onto all the rest of the power business as well. It was easy. So up, lads, and at it!

Until recently one of the most fascinating things about the idea must have been its simplicity. In the language of the show business it was "a natural." The public, it might reasonably have been supposed, was all ready to cheer for the first step in the social reform program for utilities. Presumably, as Representative Huddleston (Dem., Ala.) exclaimed in his memorable oration in Washington in June, "The country was whipped into a rage, and so, like eagles riding the storm, demagogues mounted upon this wave of ill-will." In other words, the time was ripe for the final crack-down.

THE UTILITIES

BUT later, with three defeats staring them in the face, the utility Utopians must have begun to doubt its simplicity. At the last moment there was an astonishing reversal of the public's old-time form. Presumably trained to the minute by long years of bugaboo chasing, it did not cheer when expected. Now thoughtful observers of the public scene are inquiring, "Why didn't it?" Convinced of the reasons why the fight was started, they now wonder why it ended as it did—at least this stage of it, for they expect it never to end entirely.

A search for the answers produces some interesting material. One is, of course, that the "power lobby" turned the trick, but this does not hold water, since the "power lobby" was canceled by the Administration lobby. Another is that the public was, at bottom, conscious of the "contributions" which the light and power industry has made to the enjoyment of life and work in the United States. But the real answer, in the opinion of many students, is not to be found among the most obvious of these contributions. One list, familiar enough to all Americans, would include all those ideas and services which people think of first when they try to determine what makes civilized man better off than the savages, like radios, curling irons and table lamps. But that isn't why the "death sentence" took three beatings. People take such blessings for granted nowadays and do not "reward" an industry for bestowing them.

ANOTHER list of "contributions" familiar enough to utility men, but probably not to the general public, would include some things already mentioned here—the industry's great tax payments to public treasuries in good times and bad; its continued employment of workers, its huge and dependable payroll, the gigantic investment of the public in its plants and equipment, $12,900,000,000 in round figures; its vast expenditures for materials. Such contributions may have moved a good many people to speak their minds. But the great rank and file were not familiar with these figures, and were probably not greatly interested in them.

But there was another "contribution," the reduction of rates. Here was something all consumers could understand. When the price of practically everything else was going up, when even the New Dealers insisted that nothing but higher prices could save the land from destruction, the cost of grilling a hot dog on an electric stove or of drying the sweat from a bookkeeper's brow with an electric fan persisted stubbornly in going down.

This was the only welcome contradiction in a welter of national contradictoriness. The government tried to increase all prices; the farmers objected to any increases except for farm products; industrial workers kicked at high-priced farm products; industry raised wages to meet prices, then complained that it had also to raise its own prices; a subsistence wage for the jobless aroused organized labor, which complained that this lowered the whole wage structure and reduced buying power instead of increasing it, and, finally, the Supreme Court contradicted everybody by slaying the Blue Eagle, and it was all like a crazy football game with each of the 22 players carrying a ball of his own.

In this furor, one of the institutions that went serenely about its business was the light and power business. In a world gone crazy about price-raising, it stuck to price-reducing. This, of course, was violently contradictory of New Deal theory. But not even the great Washington economists protested about it, except when they thought the utilities' price-reducing didn't go far enough. Nevertheless, it went pretty far. Conscious as people were that electricity had cost them less in depression years, most of them had no idea how much less. As a matter of fact, from 1929, the last year of the big boom, to 1934, the fifth year of the big bust-up, it cost them $421,000,000 less. Thus the electric industry in five years saved the poor—and, in fact, all of us—nearly a hundred million dollars more than President Roosevelt recently planned to soak the rich.

NOW, not even this "contribution" can be said to have moved the public and the House of Representatives to repudiate the "death sentence." But this one came close to being fundamental. And the fundamental reason, in the opinion of a good many observers, why the public refused to cheer the "death sentence" as expected, but instead spoke out against it, was that the light and power industry, as at present conducted, seemed to them to represent one of the last surviving bulwarks of American business stability.

In a nightmarish land, where the symbolic Good American was not he who worked and saved his money and became successful, but he who lay under a tree all day discoursing on the advantages of leisure, this power industry continued to believe in working for a living. In a country where failure seemed not the exception but the rule, where the day's headlines recorded the collapse of half-baked ideas and the failure of smart "programs," schemes, windbags, mountebanks and governments, an honest record of the power business showed no failure at all.

To be sure, there were "holding companies." But at least most of them were not in the shameful and growing galaxy of American flops. The good ones had succeeded at their main job, which was to sell and furnish a dependable electric service at a price that decreased as the use increased.

Among the daily headlines of failure in the American newspapers, what towns had suddenly gone dark because electric service was inefficient? What factory wheels had ceased to turn because the power failed, what theaters closed, what hospitals, distilleries, electric railroads, had suddenly gone dead? In brief, had the utilities anywhere in the country fallen asleep at the switch? The answer, of course, was "No."

IF ANY "contribution" of the power industry was responsible for the refusal of the American people to skin it alive and turn its hide over to the New Deal taxidermists, it was probably this example of sanity, safety and stability. But this forces us to the curious conclusion that the stability and solidity of the electric industry both invited the attacks and repulsed them, which sounds paradoxical and far-fetched. Yet it may not be as paradoxical as it sounds. It may mean that there were two men struggling for the life-raft instead of one, each intending to pull the other aboard, of course, but each wanting to get there first and navigate it—one the

[*Continued on page 74*]

One of a Series of Intimate Talks with Industry Executives

Jones on Industry Planning

An Interview by
EARL
WHITEHORNE

FOR twenty years electrical men have discussed the need for planning for the broad progress of the entire industry. The four branches of the industry have had their separate associations since the early days. But there has been no working co-ordination between them. Unity in market development was attempted through the S.E.D. But it failed.

Now we come out of an educational experience in organization. The possibilities of industry self-government have been explored and tested under the codes and each group appreciates these values as it never has before. So with the Blue Eagle plucked and thrown out of the nest, the national electrical associations face the problem of strengthening the power of voluntary co-operation. Also, manufacturers, wholesalers, contractors and dealers have all suffered from the present political persecution of the power companies, and the old idea of all working together for common interests and mutual protection is receiving some serious thought.

Better balanced program certainly important

The electrical manufacturers have gone further along the path of self-government than the other groups. N.E.M.A. is our most highly organized association. It is particularly affected by the activities and policies of the rest of the industry. So I talked the other day to Frank C. Jones, the president of N.E.M.A. He is a wire and cable manufacturer and heads the Okonite Company. I asked him what he sees ahead for industry co-ordination, that a better-balanced program may be developed for future progress. Is it an important issue today from the manufacturer's point of view?

"It certainly is!" he said. "And though I can't speak for the other associations, I cannot see how it can be less important to them than it is to N.E.M.A. We are all in the same boat and have got to pull together. For the electrical industry cannot hope to prosper if any vital part of it is held back in its development.

"We have learned a great deal from NRA. We have gained much practice in working together. And since the government provided no enforcement, compliance under the codes was obtained only through co-operation anyway. Therefore we actually stand today in a better position than before, because we have more freedom of action, with Washington red tape out of the way. We are better able to go forward with the bigger job that has been unfolding before us.

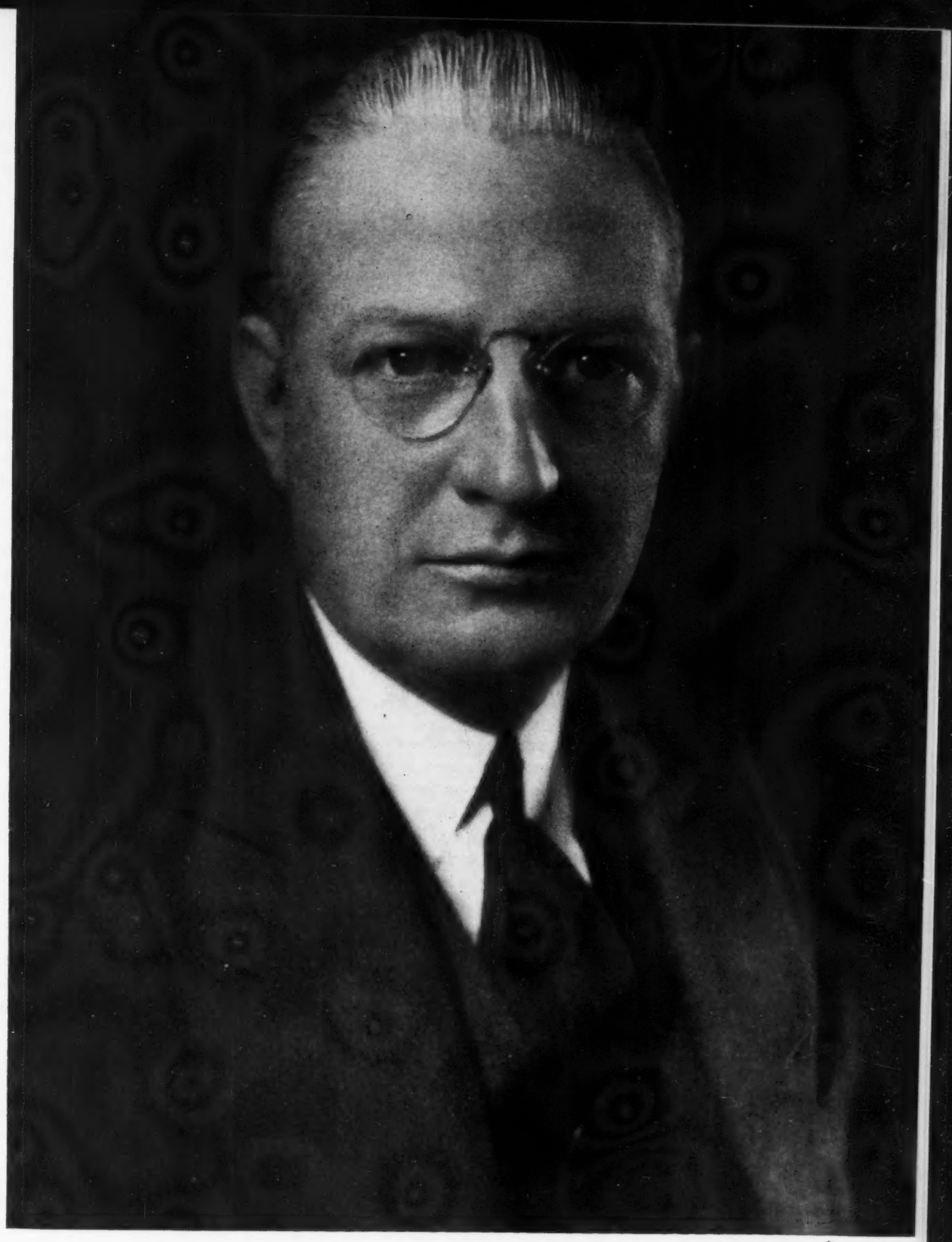
"As a result of the intensive studies that have been made, we have discovered that the most difficult problems of modern industry are commercial and political. We used to be concerned principally with matters of standardization and engineering. Today our membership is calling for help on industrial relations, insurance, simplified accounting, legislation and market development. Our statistical service grew enormously under NRA and our engineering activities also. We have many more sections in the organization, too. But the nature of these new activities is steadily taking us further afield, where the interests of all branches of the electrical industry are involved. It is increasing the need for understanding and teamwork between the electrical associations."

So the big problem that Mr. Jones and his fellows are struggling with is not how to deal with the "chiseler" of prices. Every industry has to reckon with this small, selfish minority that stupidly thinks only of immediate gain and does not like to discipline itself for broader purposes and future progress. But these "chiseling" gentlemen are more worried now than any one else, for fear they are going to lose the umbrella that the code held over them. The most difficult task that the National Electrical Manufacturers Association faces is to find a way to give more to its members, when they all want dues reduced, now that NRA is out.

Business is again in the driver's seat

"The pendulum is swinging back," Mr. Jones continued. "We are trending away from government interventions and matters of new markets and more business are the vital interest. N.E.M.A. is now evolving a broad market development program. As we get further into it, our various sections are finding that they want to tie in with special selling programs for their specific products. And it is just another step to see how constructive it would be if these plans of ours were sensibly related to the plans of the utilities, the wholesalers and contractors.

"Frankly, I believe it will come. It is inevitable. Selling is speeding up in the electrical industry. A great market expansion lies before us as rural service is extended, as domestic load forges ahead and as factories modernize with the recovery of business. But if we are to create this steadily increasing prosperity through the next few years, we must be effective as an industry."



FRANK CAZENOVE JONES, president of the Okonite Company and president of the National Electrical Manufacturers Association, was chairman of the late Code Advisory Committee and has been deep in the problems of industry self-government. Out of this background his look ahead is worth attention.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

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Back of Utility Persecution

FEW understand just why the New Dealers are attempting to destroy private enterprise in the utility field. There is no reason for this action that can be found to fit the facts, except as logic is used to interpret the acts of some in Washington. This has been done by Mr. Tompkins in this issue.

In this article the writer, a practical newspaper man with experience in Washington and Europe, and experience likewise in the utility field, announces the discovery of a curious and unfamiliar theory about the current battle over the utility business. We call his essay "New Dealers Covet Utilities." He declares the reason the New Dealers are so eager to subdue the power and light business and get hold of it is that they have planned to use its vast earning power to pay, first, the appalling billions which their unsuccessful experiments have already cost and, second, to pay for conducting the new experiments.

Mr. Tompkins' idea is a novel one and he makes it sound almost logical. But discerning skeptics will cock a questioning eyebrow at it nevertheless, and for one compelling reason, namely, that in order to believe it you must believe that the New Dealers really are working according to a "plan," and that they really have a "program." A good many of these people would be in favor of this plan if they could really believe the Administration had thought it out and knew where it led. But they will be opposed to it because they are convinced it is just another one of the happy-go-lucky, haphazard children of the social experimentalists who are now gayly skipping from one intellectual trial marriage to another in Washington, D. C.

But Mr. Tompkins does not vouch for the theory. He merely reports that it is current in Washington and that it is startling to some persons who would heartily dislike to see any American government get within its hands an easy method of perpetuating the current spirit of irresponsibility in the spending of the public's money. His deductions are logical.

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Light Launches a Broader Program

PLANS for the coming lighting season—still in the making—show that light has become merchandise at last, and is salable. It is a remarkable testimonial to what organization will do. Forty-some manufacturers are now working together to promote eyesight conservation through better lighting equipment. More than 550,000 reading lamps bearing the I.E.S. tag were sold last season.

This year the Eye Conservation Institute is in action with a complete light-prescribing technique and equipment which has been received enthusiastically by the optical industry and is in growing use by those who sell eyeglasses to the public. This broad program is to be supported by a nation-wide radio broadcasting that will bring home to people everywhere the vital necessity for eye care.

Electrical men have been promoting better illumination for years. They have been talking about light—the thing they wanted to sell. Now at last the whole story has been translated into the language of the people and put into the mouths of those who are the natural guardians of our eyes. It is so eminently sensible, so vitally in the public interest.

It is not strange that the optical and paint industries have joined the electric bulb and lamp manufacturers in this movement, why the optical profession is co-operating with the illuminating engineer. The wonder is why the natural combination has not been formed before. But one thing is sure—electrical men have never devoted themselves to a greater service to humanity.

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Performance Instead of Composition

MATERIALS used extensively by other industries are used by the electrical industry, but often under circumstances that do not hold elsewhere. Paint is a good example, even if it is not subjected to effects arising out of leakage currents, corona, electrolysis or other strictly electrical phenomena. The kinds of surface to which paints are applied and the type of exposure will often differ substantially from what happens to paint in other applications.

Shall, then, the electrical engineer specify the materials of which his paints shall be made or shall he

stipulate the performance he requires and leave the composition to the paint manufacturer? Paint making is both an art and a science now more than ever, and the reputable producers know what constituents give particular properties to their product. Conversely, they undoubtedly know what processing is needed to develop certain performance properties. Probably the electrical user of paints will do the wiser thing if he dictates what he wants for performance and lets the paint maker make up the mixture. Some form of co-operative research could be helpful to bring out factors that have not been adequately covered and correlated in the work the paint industry itself has done over the years to adapt its products to specialized uses.

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Electric Kitchens as a Slum Clearance Feature

PLANS of the Housing Division of P.W.A. to include electricity for lighting, cooking and refrigeration in the monthly rentals charged in its slum clearance housing projects are announced in this issue. It launches an experiment of great interest to the electrical industry. In a word, P.W.A. will offer small low-rent apartments, equipped with electric ranges and refrigerators, and by purchasing the energy at wholesale will be able to provide the tenant with the service at a saving over prevailing costs of coal and ice. The figures are impressive.

Immediate benefits to the electrical industry are obvious. Many non-profitable minimum bill customers of the local power company will now produce an income of from $2.30 to $2.90 per month and at the same time the usual costly customer transactions will be eliminated. Manufacturers will sell the appliances in bulk with opportunity to plan ahead for unusual production economies. Contractors will enjoy a greatly increased wiring job. But the most appealing prospect is the stimulus that should come out of such an experience to the whole idea of complete electrical equipment in the home. For if the electric kitchen can be made available in these large-scale, low-cost housing projects higher class tenants will demand the same conveniences. And the history of the bathroom proves that once let electric cooking become standard in the new apartment and it will soon be in universal demand.

This may bring problems to owners of modernized homes. But the government offers liberal subsidies. The purchase of power at wholesale will apparently cover energy costs, repairs and fixed charge allowances, even in nominal rentals. And the added comforts offered assure a market for the dwellings.

The most serious problems confront the power companies. What will be the effect of replacing large numbers of retail customers with a few wholesale accounts? What will be the reaction of other consumers who cannot be served under such a plan? The situation will need careful study. But it will be a notable adventure both in converting minimum bill customers to a profitable status and in promoting electric cooking and refrigeration.

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Training for the Coming Era of Electronics

THAT electronics will play an increasingly large and vital part in the future of the electrical industry is not questioned by any one even superficially familiar with the history of development that has taken place in this branch of the art in the last ten years. It may be expected—in fact, it can confidently be predicted—that the utility industry will be no exception in this regard. But, how many of the technical men of the industry are prepared for this event? More particularly, how many are contributing to its coming about?

It has been stated that the electronics will not take a foothold in the utility industry until the present generation of executive engineers passes on. We believe that this is too pessimistic an attitude. But, assuming there is some truth in it, what of the coming generation, of those next in command? If they are not prepared, what leadership will their respective companies be able to assume in the sure and coming march of electronic development? Admitting that there are hundreds of men in the electrical industry holding responsible engineering positions who are not thoroughly grounded in electronic theory and fundamentals, is there no way out?

The answer is "Yes," and the solution is obvious. Courses in electronics should be started, particularly now, when there is as yet no great rush of normal expansion work. Every one holding any position of responsibility or being trained for a position of responsibility in the expansion or operation of the electric plant ought to be made to take them. The underlying principles of thermionic emission, simpler electronic tubes, the most complex grid arrangements, circuits of every kind and description, all ought to be covered.

The benefits to be derived from such a course will be reflected in the knowledge that it will give responsible individuals in the various companies a new and an increasingly useful tool. They will be reflected further: The operating-construction personnel, being forced to tackle something new, will have their wits sharpened with the corresponding benefit on their other and what might be called more normal work. The net effect will be that electronic development of the proper kind will be welcomed by those who might normally be merely reluctant users. Further, their minds will actually contribute toward a more rapid development of the electronic art.

Lobby Quiz Makes Headlines

House and Senate start investigations of efforts for and against holding company bill — Congressman calls brain truster a liar — Gadsden resents cheka methods of Senate committee

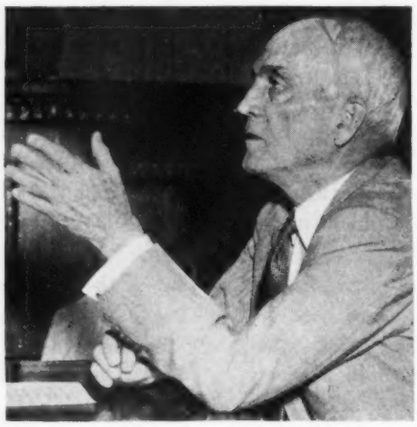
Vindictiveness and passion sharpened on short tempers caused by summer heat in Washington have characterized the first hearings of House and Senate committees appointed to inquire into lobbying on the holding company bill, whose most publicized provision, the "death sentence," was emphatically rejected by the House.

The House investigation was directly inspired by the charge of Representative Brewster of Maine that Thomas Corcoran had threatened abandonment of the Passamaquoddy project if Brewster voted against the "death sentence." Indication that the House had become resentful of Administration pushing around was quite evident from the alacrity with which the members seized Brewster's charge as the basis for an investigation. Apparently the House inquiry would be mainly concerned with Administration lobbying for the bill and less with utility efforts against it. So the Senate appointed a committee of inquiry also and started the classic process of putting the utilities on the grill in the regular Senatorial inquisitorial style with which the country is familiar *ad nauseam*.

When called before his questioners Mr. Corcoran heatedly denied that he had attempted to coerce Representative Brewster, who, in a refined and gentlemanly manner, then stated that Mr. Corcoran was a liar. This made Mr. Corcoran very unhappy and for a time it looked as though the committee meeting would actually turn into the brawl that it continually threatened to become. Corcoran's testimony brought out that his "co-operation" with House Administration leaders in fighting for the "death sentence" led him into writing three educational letters sent to all members of the House over the signatures of interested Representatives directing the battle. It also led him to prepare speeches for Congressmen, interview several House members, participate in several Congressional strategy conferences and prepare material for a message by President Roosevelt on the holding company bills.

In the meantime the Senate lost no time in getting its inquisition started. It called first Philip H. Gadsden, chairman of the Committee of Public Utility Executives, a group which was hurriedly assembled last winter to fight the holding company bill after the President had urged its passage in a special message which, one suspects, was that for which Mr. Corcoran was led, in his zeal for the holy cause, to "prepare material." Mr. Gadsden testified that his committee had raised and spent $300,000, half of which came from the Edison Electric Institute and half from contributions of individual companies. He declared that there was no secret about what the utility executives were doing. He stated that there were two classes of so-called lobbyists. One class, he said, seeks to get a selfish advantage over taxpayers of the country. The other class, "like mine," he said, "seeks to prevent efforts of its own government to destroy their property."

Illustrative of the methods employed by the Senate committee is the raid on his office described by Mr. Gadsden. He said, in a published interview the day after his interrogation, that an inch-by-inch search of his office had been made while he was testifying. No search warrant was produced to legalize the raid, Mr. Gadsden asserted, nor was any subpœna produced by the committee's attorney compelling him to appear before it. Two representatives of the Senate committee called on Mr. Gadsden at his office. One went with him to the hearing room and the other remained. "On my return," Mr. Gadsden said, "I was informed that he went over every paper in my desk and in the files, read all of them, and dashed over to the committee room with others."



Harris & Ewing

Philip H. Gadsden, president of U.G.I. and chairman of the Committee of Public Utility Executives, tells the Senate inquisitors how his committee spent $300,000 fighting the Wheeler-Rayburn bill. Mr. Gadsden's demeanor, under the questioning of the conscript fathers, made friends for the utility cause. Firmly, without apology and sincerely he set forth the utilities' position under malicious attack.

Commenting on sensational testimony that fake telegrams urged action against the holding company bill, Mr. Gadsden said: "If subsequent evidence confirms the accusation that a representative of a utility holding company had sent out fake telegrams opposing the public utilities bill, the Committee of Public Utility Executives condemns such action as dishonest just as strongly as any other group in the United States."

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R. E. Program Ready to Go

Nearly time for states to come forward and ask for slices of pie — Many are extending their plates already.

"Out of the projects nearing completion and those to follow, R.E.A. looks forward confidently to a new, different and far more complete electrification of rural districts. Mass construction, planned and executed for large areas instead of piecemeal, will be employed for the first time. Costs will be reduced." In such confident words does the Rural Electrification Administration press agent in "Release No. 19" announce, quoting Morris L. Cooke, that "the Rural Electrification Administration expects to propose to the Advisory Committee on Allotments in the very near future a substantial number of loans to finance the construction of new power and light projects in rural districts not now having electric service."

"Hundreds" of project applications are stated to have poured in already. And some of them have met the tests of engineering and legal suitability and economic soundness. R.E.A. will make no grants. Under suitable conditions it will lend the entire cost of building lines in areas now without electric service. Loans will be for twenty years, normally, at 3 per cent. No farmer will be re-

quired to mortgage his home. Loans to private companies will usually be secured through the general credit of the borrower. In certain cases, and especially on loans to non-profit agencies, the line itself will provide the security. The erection of lines will be directed by contractors, utility companies, states and subdivisions of the states, farmers and in certain instances by the federal government itself.

So much for what the federal government is doing. In the states preparations are being made to receive the manna. The Public Service Commission of Missouri has told the Missouri Power & Light Company that no part of the fixed costs of the general system may be included in farm rates, that these rates should cover operating costs plus only such fixed charges as pertain to the particular facilities installed to serve rural customers.

Rural electrification projects in Indiana now need only the money to become facts. Preliminary obstacles were removed by the Indiana Public Service Commission July 12 as it authorized the Indiana Statewide Rural Electric Membership Corporation to operate in all 92 counties of the state. The commission granted to the company a certificate of convenience and necessity and approved its articles of incorporation. The permission amounts to an exclusive franchise to operate in the state since the rural electrification enabling act authorizes only one parent corporation to operate in any county.

And in Michigan ultimate extension of electric power service to all farmers in the state, through uniform rates for construction of country power lines, has become the goal of the Public Utilities Commission, said Chairman William M. Smith, announcing a general hearing on the subject on July 16.

And even though rural electrification has been cited by the T.V.A. "as our own program," the Tennessee Public Service Company has started to build a new 14-mile rural line. This is the beginning of a proposed extensive rural network, according to R. W. Lamar, vice-president of the company.

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Strike Stops Work on Boulder Dam

Armed guards patrolled Boulder Dam after construction company officials July 14 dynamited one of the two available roads leading to the dam, to forestall a reported intention of striking workmen to march on dam property. The issues, which sent carpenters and metal workers out on strike, included protests against being forced to travel several miles to and from work on workers' own time and objections to having time taken out for lunch hour.

Utility Bill Now in Conference

Deadlock is anticipated as House conferees are instructed to insist on elimination of the "death sentence," even though conference members are six to four in favor of it.

With the Senate vote 45 to 44 in passing the holding company bill as written, appointment of four Senators in favor of the "death sentence" and of only one against it to the joint conference on the bill is regarded as distinctly unfair, but only as another instance of the kind of treatment the utilities have learned to expect. Senator Dieterich, Illinois, attempted to secure instruction of the Senate conferees not to insist on the "death sentence," but withdrew his motion on the understanding that if the conference became deadlocked they would then return for instructions. Poll of the Senate disclosed that Senator Dieterich's motion would have been defeated had a vote been demanded. As it now stands the decision rests entirely with the conferees unless a deadlock requires a Senate vote on whether the conferees of the Senate should insist on the "death sentence" or whether they should yield on the issue if the House demands concurrence in its less drastic bill.

The same unfairness, only a little less glaringly apparent, characterized the appointment of the House conferees. Although the vote by which the House bill passed was 323 to 81, the conferees appointed are three to two against the "death sentence."

Another attack on the House bill developed from another direction in the meantime. Chairman Kennedy of the Securities and Exchange Commission opposed it on the grounds that it is both unworkable and unwise. In a letter read by Senator Wheeler to the Senate he said that under the first point the House bill makes it the S. E. C.'s duty to determine if it is necessary in the public interest to limit a holding company to a single integrated system. The bill furnishes no effective standards to guide the commission, Mr. Kennedy's letter continued.

On the second point, on what is wise in government, he wrote that it was his conviction that it was not a wise policy to vest in any one group of men such a tremendous grant of power as proposed in the House bill without setting up strict guides and limitations for the exercise of that power. This objection is by far the more important of the two.

The Kennedy letter also stated that both House and Senate bills wisely gave the commission certain discretionary power in carrying out the administration of the act. But, so far as the decision of elimination is left with the commission, the letter stated that no public body should be given unfettered discretion of such importance. As a result of this letter, the S. E. C. was invited to prepare a series of amendments to meet Mr. Kennedy's objections.

As they find time to study it, utility men are beginning to appreciate that the House bill is only a little the lesser of two evils. In the excitement and the up-

EXPLAINING SOMETHING OR OTHER, AND THEY NEED TO

Harris & Ewing

The voluble hands belong to the other member of the firm, to Mr. Corcoran, not to Mr. Cohen. Here are the authors, Thomas G. Corcoran and Benjamin D. Cohen, of that highly imaginative work of fiction relating to holding companies and electric utilities which was so drastically reviewed by the House of Representatives.

roar about the "death sentence" it was easy to lose sight of what may prove to be even greater dangers. In some states the holding company has been more or less ignored as the utilities commissions maintained that control of the operating company gave them control of the holding company insofar as the latter's activities in the respective states were concerned. The real danger of Title 2, which would set up regional control under direction of a Presidential appointee, lies in its usurpation of state's rights.

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Pacific Coast A.I.E.E. Convention

Five technical sessions in the fields of power transmission, electrical machinery, communication, electrophysics and measurements are included in the program of the Pacific Coast convention, A.I.E.E., at Seattle, Wash., August 27. Many papers deal with western engineering developments and they have been prepared by well-known engineers on the Pacific Coast. The engineering features of the Boulder Dam-Los Angeles lines and the 287,000-volt coupling capacitors for the carrier-current communication channels will be discussed.

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Roosevelt Utility Policies Attacked

"President Roosevelt's public utility policies are throttling progress," declared Francis E. Frothingham, chairman of the public utilities committee of the Investment Bankers' Association, in an address on Tuesday of this week before the Wellesley (Mass.) Institute of Social Progress. The speaker averred that such enterprises as Quoddy and the T.V.A. are uncalled for and unprofitable. "The Quoddy project," said he, "is located at the far corner of Maine and is too removed from industrial markets for disposal of the expected power supply. The T.V.A. is an indefensible competition of government with industry."

Power should not be sold direct to consumers by the government, Mr. Frothingham maintained, but to power companies. As it is now the government is seeking to compete with private industry, and the result is that confidence in utilities is being undermined. There is much money awaiting investment in this counrty, the speaker said, if the assurance could be given that the government would not interfere with legitimate individual operations. The President's attitude toward the constitutionality of the Guffey bill was criticised in the address as a violation of his oath of office.

New Dealers Happy Over T.V.A. Victories

House meekly takes orders and passes "perfected" measure — Appeals Court says T.V.A. is constitutional

While delighted T.V.A. officials, including Dr. A. E. Morgan and David E. Lilienthal, looked on from the gallery, the House of Representatives by a vote of 277 to 100 on July 11 provided the authority with substantially what it had asked for by passing a bill amending the T.V.A. Act that agreed closely with that already approved by the Senate. A conference committee is now engaged in ironing out minor differences between the two measures. As first reported by the House committee on military affairs, the House bill greatly curtailed the power granted T.V.A. by the Senate. These powers, however, were soon restored by amendments offered by Administration supporters from the floor. The debate upon these admendments was lively, but ineffectual in blocking their adoption.

Pending action by the conference committee and approval by both houses, it seems probable that the act in its final form will give T.V.A.:

1. Complete control over all dams or other structures on the Tennessee River and its tributaries.
2. Authority to build any needed transmission lines, even though these may duplicate existing facilities.
3. Permission to fix rates at below-cost figures for an indefinite time.
4. Authority to make a $50,000,000 bond issue, but no exemption from taxes for these bonds.
5. Power to negotiate with local governments for the extension of distribution facilities.

According to the provisions of the House bill, T.V.A. must submit to an annual audit by the Comptroller-General's office and must turn back money receipts to the Treasury, thus retaining Congressional control over its expenditures.

The action of the House, according to Wendell L. Willkie, president Commonwealth & Southern Corporation, "means that the T.V.A. can continue to sell power to municipalities and its individual consumers at below cost and can also raid the territory of existing utilities. If any public utility company, on the other hand, would even request that it be freed from any of these obligations by legislative enactment, it would and should be accused of being anti-social, piratical and disregardful of the public interest.

Holds T.V.A. constitutional

The act creating the Tennessee Valley Authority was held constitutional July 17 by the United States Fifth Circuit Court of Appeals at New Orleans. It sustained the government's right to sell electric power in competition with private utilities. The holding reversed a decision of Judge W. I. Grubb, of the Northern District of Alabama, annulling contracts between the T.V.A. and the Alabama Power Company for the sale of government-manufactured power in seven north Alabama counties.

The decision not only held the T.V.A. constitutional but ruled Congress had conferred the necessary statutory power on the gigantic federal agency. The act's validity had been attacked by a group of preferred-stockholders of the Alabama Power Company, who sought to rescind contracts for the sale to T.V.A. of power company transmission lines in northern Alabama.

COMING MEETINGS

American Institute of Electrical Engineers — Pacific Coast convention, Seattle, Wash., August 27-30. Great Lakes District meeting, Purdue University, West Lafayette, Ind., October 24-25, H. H. Henline, national secretary, 33 West 39th Street, New York.

Illuminating Engineering Society—Annual meeting, Hotel Netherland Plaza, Cincinnati, Ohio, September 3-6. D. W. Atwater, general secretary, 29 West 39th Street, New York.

National Electrical and Radio Exposition — Grand Central Palace, New York, N. Y., September 18-28.

Electrochemical Society—Fall meeting, Washington, D. C., October 10-12. Colin G. Fink, secretary, Columbia University, New York.

National Association of Railroad and Utilities Commissioners—Annual convention, Nashville, N. C., October 15-18. John E. Benton, general solicitor, 806 Earle Building, Washington, D. C.

National Electrical Wholesalers' Association—Annual convention, Chicago, Ill., October 14-18. E. Donald Tolles, managing director, 165 Broadway, New York.

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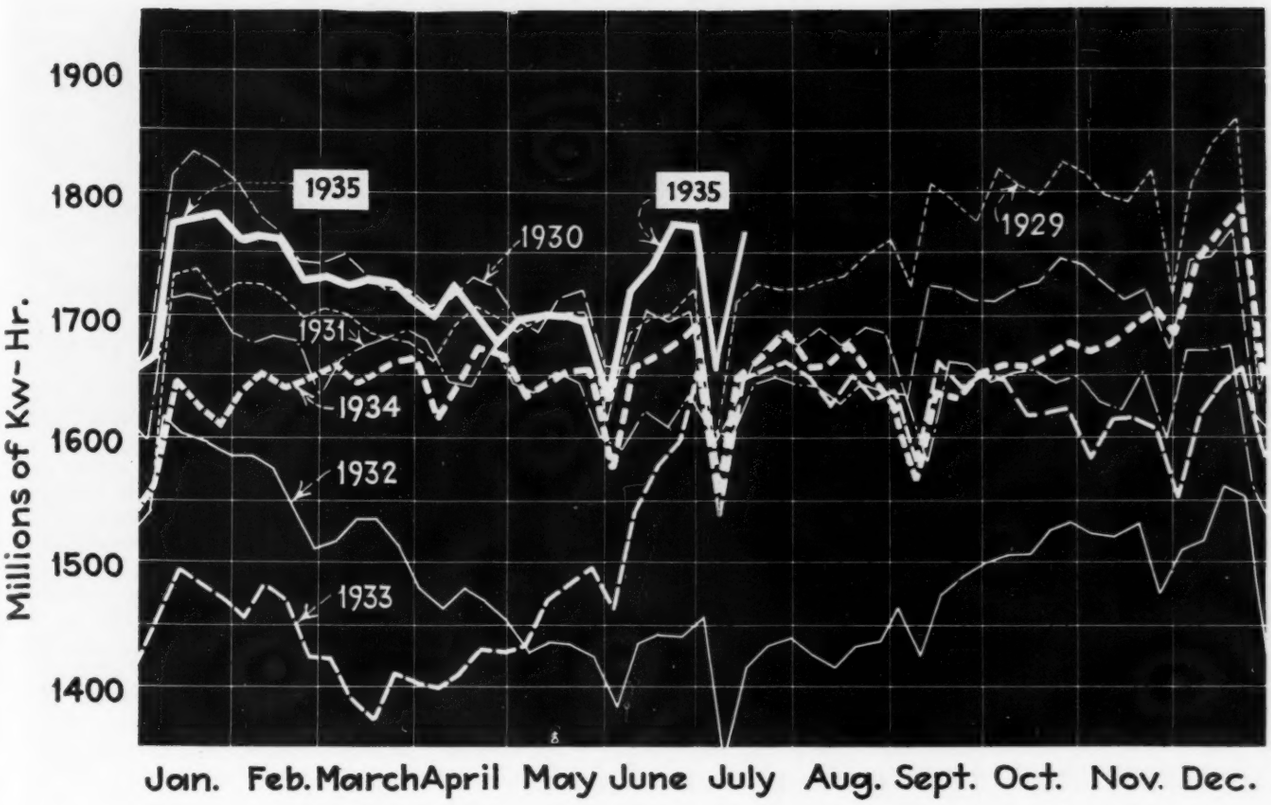
Upholds State Regulation

State regulation of public utilities was defended by Leon O. Whitsell, president of the California Railroad Commission, in an address before the American Bar Association convention at Los Angeles, July 15. Whitsell attacked the "growing political philosophy which is being broadcast from high places that state regulation is a failure," stating that "under the administration policies of the California Commission the people have continued to enjoy adequate service at reasonable rates, and industries have grown up and experienced an unprecedented measure of prosperity."

He stated that rural electrification "has kept pace with the progress of the state, and the farm load has shown a gradually ascending curve. The domestic use of electricity has continued to increase and electric power has become the first essential of the home."

Output Sets New Summer Records



Rising 7.2 per cent higher than in the corresponding week last year, and almost matching the two record-breaking weeks in June, the output of electric light and power plants last week set a new level for July. According to the Edison Electric Institute it amounted to 1,766,010,000 kw.-hr., thereby surpassing the previous maximum for the like week, attained in 1929, by 3.1 per cent.

Midsummer operations, usually the lowest of the year, are therefore continuing almost at the pace of last winter and still foreshadow a new all-time peak next December. It seems clear now that the upturn, instead of starting in late August, as is normally the case, came at the beginning of June. Unusually large gains over 1934 in the Mountain states appear to reflect heightened activity in the mining of metals, but strong gains appear also in the eastern and central industrial areas. The Pacific region alone is not up to 1934 operations.

In the preceding week the sag due to the holiday was smaller than in 1934.

Weekly Output, Millions of Kw.-Hr.

1935		1934		1933	
July 13	1,766	July 14	1,648	July 15	1,648
July 6	1,655	July 7	1,556	July 8	1,539
June 29	1,772	June 30	1,688	July 1	1,656
June 22	1,775	June 23	1,675	July 2	1,598
June 15	1,743	June 16	1,665	June 17	1,578
June 8	1,724	June 9	1,655	June 10	1,542

Per Cent Change from Previous Year

Region	Week ended July 13	July 6	June 29
New England	+ 7.1	+ 7.4	+ 6.7
Middle Atlantic	+ 8.7	+ 4.4	+ 4.4
Central Industrial	+ 6.3	+ 6.6	+ 2.3
West Central	+ 9.2	+ 5.7	+ 3.3
Southern States	+ 8.6	+ 9.9	+ 6.8
Rocky Mountain	+25.0	+31.3	+28.4
Pacific Coast	— 0.4	— 1.2	+ 2.1
United States	+ 7.2	+ 6.4	+ 5.0

R.F.C. Quits Control of Utilities Power & Light

By disposing of its holdings in the Public Utilities Securities Corporation, owner of control of the Utilities Power & Light Corporation, to the Atlas Corporation, the Reconstruction Finance Corporation has relinquished control of the Harley L. Clarke finance company.

Jesse H. Jones, chairman of the R.F.C., stated that the R.F.C. had received a total of $2,260,000 in debentures of Utilities Power & Light Corporation. He said: "We traded the notes of the Webster Securities Corporation to the Atlas Corporation for 5 per cent debentures of the Utilities Power & Light Corporation, the latter company being a subsidiary of the Public Utilities Securities Corporation, which, in turn, is a subsidiary of Webster Securities Corporation.

"We are out of the Public Utilities Securities Corporation and the representatives of the Reconstruction Finance Corporation recently elected to the position of directors in that company have resigned." (ELECTRICAL WORLD, March 30, page 125, and April 13, page 48.)

The sum involved represents the principal and accrued interest of defaulted Webster notes held by the Central Republic Trust Company and acquired by the R.F.C. as collateral for a loan made by it. By the latest transaction the R.F.C. assumes the status of an investor in the holding company rather than the holder of a controlling interest in the management.

According to a statement by Floyd B. Odlum, president of Atlas Corporation, the latter considers its investment as being only temporary and has no intention of becoming actively interested in the management of Utilities Power & Light.

New York Metal Prices

	July 2 1935 Cents per Pound	July 16 1935 Cents per Pound
Copper, electrolytic	8 00*	8 00*
Lead, Am. S. & R. Price	4 00	4 15
Antimony	12 50	12 50
Nickel ingot	35.00	35.00
Zinc, spot	4.675	4.675
Tin Straits	51.75	52 25
Aluminum, 99 per cent	19—21	19 - 21

*Delivered Connecticut Valley

More Utility Refunding

Low interest rates and increased confidence of the investor are enabling utilities to make important reductions in their annual costs for capital. During the first half of the current year seven bond issues of outstanding magnitude were announced for refunding existing debts. These seven alone amount to a total of $221,594,000.

Issues thus far announced in July total $234,265,000. This includes one of $53,000,000 at 3½ per cent due in 1965, of the Edison Electric Illuminating Company of Boston, awarded on a bid of 101.913 to a syndicate headed by the First Boston Corporation. It will be used to retire two issues of short-term notes due in 1937. Temporary bank credit at 2½ per cent per annum is being used for the interval between calling the old notes and delivery of the bonds.

The financing of $108,000,000 in two issues by the Southern California Edison Company is stated to represent the largest amount of new securities registered by any one company under the provisions of the Securities Act. This year's refunding will decrease the company's annual interest charges by $950,000. Aside from the $108,000,000 at 3¾ per cent, the funded debt will include $3,600,000 at 4½ and $34,050,000 at 5 per cent.

Stockholders of Public Service Company of Northern Illinois have approved a proposal to issue $16,000,000 series I first lien and refunding mortgage at an interest rate probably around 4½ per cent. Proceeds will be used to retire an equal amount of 6½ per cent bonds. This is a further step in the refunding program. On June 3 the company refunded $10,650,000 7 per cent debentures, selling $6,900,000 five-year serial 3¼ per cent notes to four Chicago banks and borrowing $2,670,000 at 5 per cent from affiliates.

Refunding is also planned, according to press reports, of $15,172,000 Kansas Power & Light Company first and refunding mortgage bonds. The interest rate is not stated. Three series are outstanding, one of $6,500,000 at 5 per cent and two aggregating $8,672,000 at 6 per cent.

For the proposed issuance of $70,000,000 first 3½s, dated June 1, 1935, due June 1, 1965, the Duquesne Light Company filed a registration statement with the S.E.C. on June 28, 1935. Proceeds, with other funds, are to be used to redeem in September, 1935 (a) $65,000,000 first 4½s, A, 1967, at 104 and (b) $5,000,000 first 4½s, B, 1957, at 110.

Announcement has been made of a public offering of $40,000,000 3½ per cent general mortgage bonds of the Cleveland Electric Illuminating Company. Proceeds, together with other treasury funds of the company, will be used to redeem all of the company's bonds now outstanding with the public in like amount as follows: $18,500,000 first mortgage, $11,500,000 general mortgage series A, and $10,000,000 general mortgage series B. The redemption price will be $41,695,000.

The Connecticut Light & Power Company has completed the private sale of $10,000,000 series E first and refunding mortgage 3¾ per cent sinking fund 30-year bonds to a syndicate of six buyers. Bonds called include series B 5½ per cent bonds payable August 1 and include a premium of 7½ per cent and accrued interest; Eastern Connecticut Power Company, 5 per cent bonds called for payment October 1, 1935, with a premium of 5 per cent and accured interest.

Major Refunding Issues During First Half of 1935

Laclede Gas Light Co. ref. and extension mtge. 5s, due April 1, 1939	$10,000,000
Pacific Gas & Electric Co., first and ref. mtge. 4s D, 1963	45,000,000
Southern California Edison Co., Ltd., ref. mtge. 3¾s, 1960	73,000,000
San Diego Consolidated Gas & Electric Co., first mtge. 4s, 1965	15,500,000
Pacific Gas & Eletric Co. first and ref. mtge. 4s G, 1964	30,000,000
Commonwealth Edison Co. first mtge. 3¾s H, 1965	29,500,000
Consumers Power Co. first lien and unif. mtge. 3¾s, series of 1935, due 1965	18,594,000

Issues Announced First Week in July

Central Hudson Gas & Electric Corp. first and ref. mtge. 3½s, 1965	9,765,000
Southern California Edison Co., Ltd., ref. 3¾s B, 1960	35,000,000
Southern Utah Power Co. first sinking fund 5½s, 1960	500,000
Edison Electric Illuminating Co. of Boston, first mtge. A, 3½s, 1965	53,000,000

Baltimore Company Calls Preferred Stock

All outstanding 6 per cent series D and 5½ per cent series E preferred stock of the Consolidated Gas, Electric Light & Power Company of Baltimore is to be called on October 1. There are outstanding $2,750,000 of the former and $2,250,000 of the latter, both callable at $110 a share. Holders are to be given an opportunity to exchange them, share for share, for 5 per cent series A preferred stock. No increase of capitalization is involved in this change of preferred stock.

In addition the company announced on July 11 that it was selling $7,326,000 of thirty-year 3½ per cent bonds, called series M, first refunding mortgage sinking fund bonds, to a group of seven institutional investors. It is calling for redemption on September 10 its outstanding 4½ per cent bonds, series H, in equal amount at 105 plus accrued interest from July 1.

The company had previously retired $9,943,000 4¾ per cent bonds due in 1969 and $13,845,000 of maturing 4½ per cent bonds through sales of 3¾ per cent bonds maturing in 1960 and 1964 respectively. The latest action brings the refinancing of bonds and senior stock at lower annual charges during the past twelve months to approximately $36,000,000.

Current Earnings Reports

Operating Companies

	1935	1934
Alabama Power Co. (Year ended May 31)		
Gross earnings	$15,810,560	$15,675,750
Net balance	587,775	724,802
Consol. G. E. L. & P. Co., Baltimore (Year ended May 31)		
Gross earnings	19,693,545	18,392,720
Net balance	4,854,690	4,801,633
Detroit Edison (Year ended May 31)		
Gross earnings	46,064,750	43,775,705
Net balance	5,367,331	7,381,480
Duquesne Light (Year ended April 30)		
Gross earnings	25,820,442	24,545,921
Net balance	10,338,107*	10,352,116*
Edison El. Ill. Co. of Boston (Year ended May 31)		
Gross earnings	29,799,793	29,492,737
Net balance	5,263,880	5,076,872
Long Island Ltg. Co. (Year ended March 31)		
Gross earnings	19,886,393	19,919,186
Net balance	574,714	1,359,974
New Orleans Pub. Serv., Inc. (Year ended May 31)		
Gross earnings	15,100,724	14,977,562
Net balance	229,623†	120,438†
Ohio Edison Co. (Year ended May 31)		
Gross earnings	15,552,912	14,836,800
Net balance	1,449,480	1,343,020
Penn. Pwr. & Lt. (Year ended May 31)		
Gross earnings	34,314,880	33,514,372
Net balance	4,741,348	5,480,273
Puget Sound P. & L. & subs. (Year ended May 31)		
Gross earnings	13,471,621	12,848,395
Net balance	1,449,927†	1,450,213†
Virginia Elec. & Pwr. (Year ended May 31)		
Gross earnings	15,199,398	14,891,698
Net balance	1,588,224	1,549,030

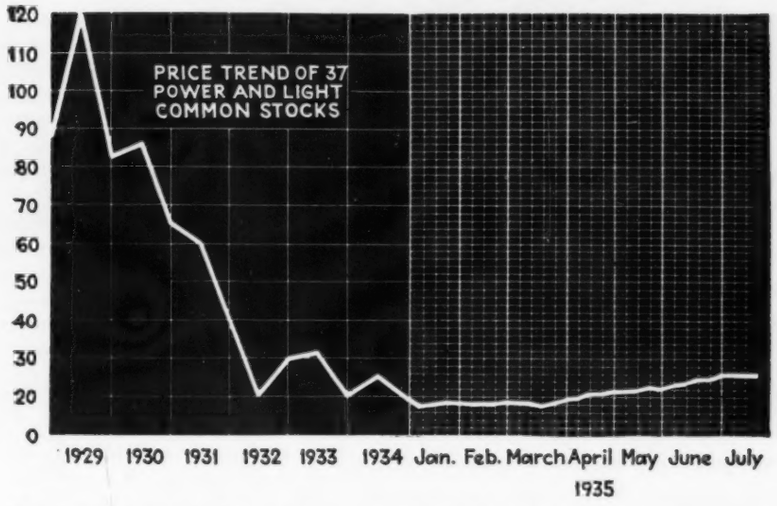
Holding Companies

	1935	1934
American Power & Lt. & subs. (Year ended April 30)		
Gross earnings	$77,984,706	$73,266,144
Net balance	5,246,394	3,690,894
American Water Works & subs. (Year ended May 31)		
Gross earnings	46,717,004	44,655,299
Net balance	1,498,950	2,504,852
Commonwealth & Southern & subs. (Year ended May 31)		
Gross earnings	117,473,608	111,885,527
Net balance	1,075,514†	212,917†
Elec. Pwr. & Lt. & subs. (Year ended April 30)		
Gross earnings	75,568,796	69,575,238
Net balance	216,707†	1,211,375†
National Pwr. & Lt. & subs. (Year ended April 30)		
Gross earnings	71,535,647	69,662,288
Net balance	6,317,971	6,696,476
Northern States Pwr. (Del.) & subs. (Year ended April 30)		
Gross earnings	32,299,850	31,307,049
Net balance	5,041,217	5,544,885
Philadelphia Co. & subs. (Year ended April 30)		
Gross earnings	47,091,962	46,083,610
Net balance	7,533,332*	7,895,047*
Public Service Corp. of N. J. & subs. (Year ended May 31)		
Gross earnings	120,380,957	118,706,264
Net balance	24,857,685*	26,171,902*
United Light & Pwr. Co., Consol. earnings (Year ended April 30)		
Gross earnings	74,573,976	72,113,986
Net balance	730,889*	1,450,095*

*Available for all dividends. †Deficit.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

Utility Stock Rise Halts



Prices of electric light and power stocks halted their upward movement and turned slightly downward. The "Electrical World" index, after rising to 26.7 for the first week of the month, held at 26.6 the first week and slipped to 26.3 in the third.

Service Standardization Lags in England

In spite of the fact that certain high ranking T.V.A. officials a few months ago gave themselves a nice taxpayer-financed trip to England for the purpose, according to the usual lavish newspaper publicity, of getting ideas to be used in their "happy valley," many problems remain to be settled before cheap electricity is given to the sturdy Briton. Some of these problems are technical, most of them financial and a few of them political. Standardization is one of the most urgent problems, in the opinion of E. E. Hoadley, president of the National Electrical Convention, recently held at Bournemouth, England. Industrial supply and domestic development was the theme of the convention.

•

Canadians Warned Against U.S. Power Propaganda

Before a largely attended convention of members of the Canadian Electrical Association from all parts of Canada held at St. Andrews, N. B., June 26-28, the retiring president, John Morse, Shawinigan Water & Power Company, emphasized the need for all those in authority in power matters in Ontario and Quebec to remember that the power problems of that part of the dominion, which comprises over 65 per cent of the total population, must be solved without regard to interprovincial boundaries and irrespective of the fact that on the westerly side of this boundary public ownership is acceptably practiced and that on the easterly side private operation is, with equal acceptance, the permanent policy of the people. Mr. Morse warned his hearers about the flood of power propaganda from Washington, much of which has spread into Canada and very little of which has practical application north of the international boundary. He cited such enterprises as the Tennessee Valley Authority and the Passamaquoddy tidal scheme as examples of non-self-liquidating projects, the real significance of which is difficult to secure from the propaganda which their zealous governmental advocates are so persistently broadcasting.

Elections for the season 1935-36 included: President, R. B. Baxter, Calgary Power Company, Ltd.; vice-presidents, E. H. Adams, British Columbia Electric Railway, Ltd.; R. H. Mather, Shawinigan Water & Power Company, and M. C. Gilman, Winnipeg Electric Company. New members elected to the executive committee include H. Forbes-Roberts, Prairie Power Company, Ltd., Regina, Sask., and A. S. Edgar, Canadian General Electric Company, Ltd., Toronto.

•

Superposed Unit for Cedar Rapids

No longer having an adequate margin of safety in surplus prime capacity on its system because of steady load growth, the Iowa Electric Light & Power Company will add a 5,000-kw. turbo-generator to its Cedar Rapids station. It is planned to remove two boilers having a capacity of 30,000 lb. of steam per hour each and replace them with one high-pressure unit to supply 250,000 lb. per hour. The new boiler will be operated at approximately 700 lb. pressure. Total steam temperature will be 750 deg.

The new turbine will exhaust to the low-pressure header at 215 lb. pressure and 550 deg. of temperature. The steam capacity of the new boiler is equivalent at the station's present water rate to approximately 16,000 kw. in the low-pressure turbines, a total of 21,000 kw. Total cost of the improvement, including the cost of dismantling and removing the old equipment, will be approximately $350,000. It is estimated that the installation will be completed by November 1.

•

G. E. Earns 40 Cents Per Share

Operations of the General Electric Company for the first six months this year showed a substantial improvement over those for the same 1934 period, according to the report of the company. Orders received, sales billed and net income were well above the figures for the first half of last year. A comparative statement of sales and earnings for the six months ended June 30 follows:

	1935	1934
Net sales billed	$94,546,273	$80,983,093
Less: Costs, expenses and other charges.	87,206,901	74,818,535
Net inc. from sales..	7,339,372	6,164,558
Other inc. less int. paid and sundry charges	4,202,056	3,298,533
Net profit	11,541,428	9,463,091
Spec. stocks divs. ..		1,287,534
Profit available for divs. on common..	11,541,428	8,175,557

•

Sangamo Electric Catching Up on Dividends

Sangamo Electric Company may pay the balance of its preferred stock dividend accumulations by the end of the year, R. C. Lamphier, president, indicated in a letter sent to the company's stockholders. The letter stated that sales for the first six months of this year exceed the same period last year by over 50 per cent and that the company will show a net profit of approximately $160,000, including $50,000 of dividends from subsidiaries.

•

Kelvinator Expands Lines and Operations

Designed especially to meet the growing demand for commercial refrigeration in many lines of business, a new line, consisting of 128 condensing units, has been announced by Kelvinator Corporation. For air conditioning the company now makes a line of 63 standard units from 1-3 to 20 tons cooling capacity.

Information from Columbus, Ohio, states that the Automatic Reclosing Circuit Breaker Company has announced an increase of its paid-in capital, by the sale of all authorized but unissued stock to the Kelvinator Corporation. The deal involved $300,000.

Air-Conditioned, Windowless New Hershey Office

An air-conditioned, windowless office building is now being erected at Hershey, Pa., to house the executive offices of the Hershey Chocolate Corporation. The building was designed by D. Paul Witmer of the Hershey Lumber Products Company, and A. Bowman Snavely, chief engineer of the Hershey Chocolate Corporation. The air-conditioning system was laid out by these men, working in cooperation with engineers of the York Ice Machinery Corporation, which is installing the air-conditioning system. Proper insulation of the building and the elimination of heat leakage through windows will result in appreciable reduction of both the summer cooling load and the winter heating load, so that an over-all decrease of 25 per cent in the cost of operating the air conditioning is expected through this new type of construction.

•

Contract for Lock Control

Contract for construction and installation of a power control and lighting system as lock and dam No. 10 near Guttenberg, Iowa, has been awarded to the Sterling Electric Company of Minneapolis for $83,240.

•

Refrigerator Sales Steady

Sales of complete household electric refrigerators in the United States in May totaled 222,588 units, compared with 222,802 units in May, 1934, according to reports to the National Electric Manufacturers Association by fourteen manufacturers. During April 211,164 complete refrigerators were sold.

With unit sales almost the same in May this year as in the like month last year, the value to the manufacturer was only $16,656,789, compared with $19,131,541 in May last year, and with $17,329,146 for a considerably smaller number in April, this year.

World sales of complete electric household refrigerators in May by the fourteen companies totaled 237,609 units with a value to the maker of $17,783,417.

For the first five months, sales of these units by the same makers totaled $760,988, with a value to the maker of $62,355,540, against 650,447 units with a value of $56,669,740 in the first five months of 1934. The selling season for refrigerators started much earlier in 1935 than in 1934, with the result that the first two months piled up a big lead in unit sales. This lead has been maintained throughout the balance of the peak selling season, to date.

Reflecting the sale for the year to date of the cheaper models of refrigerators made available about mid-year last year, the average unit price dropped to $81.94 for the sales this year, against $87.12 for the units sold in the like period last year. Average price of refrigerators sold in May was $74.84.

•

Sharp Gain in Profits

The Benjamin Electric Manufacturing Company, Des Plaines, Ill., has reported a net profit of $163,819 after charges and federal income tax for the fiscal year ended March 31, compared with a net profit of $37,819 in the preceding fiscal year.

•

Allis-Chalmers Shows Profit

Allis-Chalmers Manufacturing Company earned about $500,000 net in the second quarter which ended June 30, 1935, according to current reports. This is in contrast to a net loss of $22,242 in the first quarter this year and a net loss of $145,100 in the second quarter of 1934. It is understood that the company began to operate profitably in March, cutting down the loss shown for the first two months of the year, and has continued in the black since that time. The profit for the second quarter this year will result in a substantial profit for the first six months of the year. In the like period last year the company had a net loss of $822,253 and for all 1934 the net loss was $1,039,406. The company is running on heavy production schedules in its tractor and turbine departments. Some good demand is coming from farmers, along with heavy government orders.

Westinghouse Jobbers Optimistic

Selling far ahead of 1934 sales for the same period, electrical appliances, equipment and supplies are reflecting both improved public buying and general business improvement, according to expressions and opinions made by leading executives at the 23d annual meeting of the Westinghouse Agent-Jobbers Association at Virginia Hot Springs. Members of the group of 92 houses reported increases in practically all lines, some individual items showing as much as 400 per cent increase over the same months last year. Lowered power rates are stimulating use of current, it was pointed out, and that same fact is generating many purchases of heavy equipment and industrial supplies. During past years the replacement of obsolete or inefficient equipment has been held to a minimum, apparently, but now the orders are beginning to flow through in very encouraging volume, reported supply house executives.

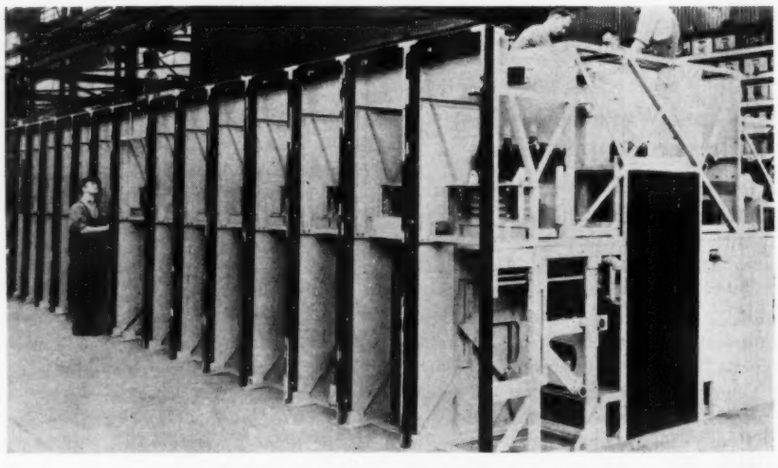
•

Woodward Governor Meeting Draws Large Attendance

Problems of control of all types of prime movers from airplane engines to hydraulic turbines were discussed and explained in meticulous detail at the seventh prime mover control conference at the Woodward Governor Company plant at Rockford, Ill., June 25-29.

The conference was attended by about sixty engineers from widely separated points; the registration list included names of men from Seattle, Los Angeles, Alabama and Newfoundland.

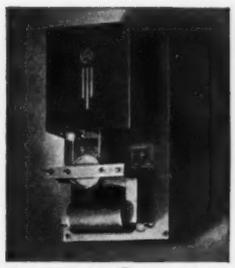
BOULDER DAM METAL-CLAD SWITCHGEAR



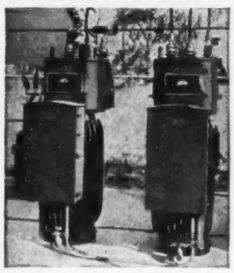
This vertical lift switchgear, being assembled in the shop of the Delta-Star Electric Company, will control two 3,000-kva. station service transformers, one 3,000-kva. station service bank and all 2,300-volt feeders supplying the power house auxiliary equipment at Boulder Dam. The assembly consists of 30 units, fifteen in a row, back to back, with a cable way between.

For *Profitable* Voltage Regulation

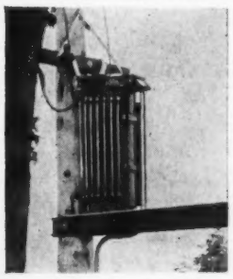
The 8-POINT PLAN
Offers New and Improved Equipment for the Solution of Every Voltage-regulation Problem.



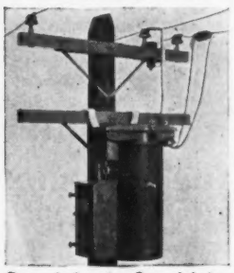
Automatic Generator-voltage Regulators



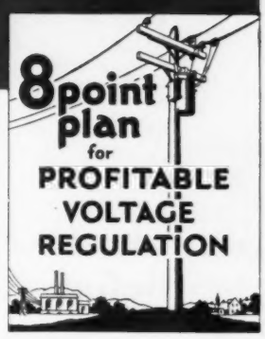
Station-type Induction Voltage Regulators



Branch-feeder Induction Voltage Regulators



Branch-feeder Step Voltage Regulators



THE 8-POINT PLAN offers an opportunity to improve voltage at a profit by providing equipment for economical regulation at every vital point on the power-company system.

The problem of voltage regulation is today of major importance. It has been made increasingly complex by the addition and extension of urban and rural branch feeders and the increasing load in all areas. Individual feeder induction regulators at your substations do a good job and are fully adequate for feeders confined to medium- and high-load-density areas. Branch-feeder regulators supplement substation regulation in the light-load-density sections at a cost consistent with revenue.

The General Electric Company has developed a comprehensive line of voltage-regulating devices to meet these problems. They are presented in the 8-POINT PLAN.

Let us point out to you how sound economics dictates the use of the equipment offered by the 8-POINT PLAN. Send for a folder giving complete economic and application information. Simply address the nearest G-E sales office or General Electric, Dept. 6K-201, Schenectady, N. Y.

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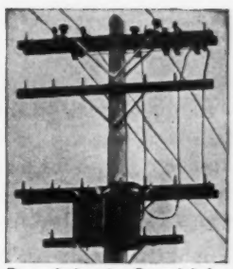
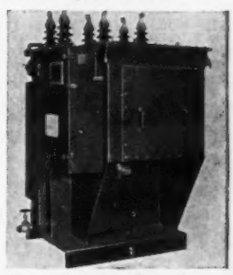
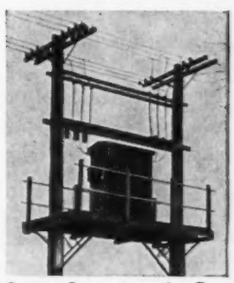


Branch-feeder Step Voltage Boosters



Step Voltage Regulators for Higher Voltages



Series Capacitors for Reducing Lamp Flicker

Autotransformers for Reducing Lamp Flicker

GENERAL ELECTRIC

OPERATING PRACTICES

ENGINEERING • CONSTRUCTION • OPERATION • MAINTENANCE

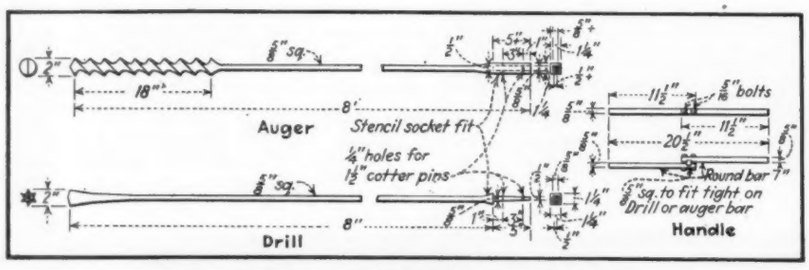
Auger Holes for Ground Leads

By S. C. HENTON
Division Engineer
Ohio Edison Company, Akron, Ohio

Getting an adequate ground may necessitate going to considerable depth. In the Akron division of the Ohio Edison Company it has been found necessary to sink ground wires 13 ft. or more to reduce ground resistance to a value of 10 ohms or less. Driving a rod to this depth often buckles the rod or breaks out the clamp. To avoid these difficulties and delays an auger-drill has been made up in two 8-ft. sections of square steel shaft socketed so as to cotter-key the sections together as the depth progresses. A turning handle is made of two 11½-in. lengths of ⅝-in. round bar coupled together with a ⅝-in. square hole at their junction to fit either shaft at any desired position. The grounding hole can be placed close to the pole or in the bottom of a new pole hole to the required depth.

Water is used with the auger end except in rock boring. The right amount of water will help the auger remove mud and small stones if the tool is churned up and down. The drill end is used as a churn drill for breaking up small boulders and shale into fragments small enough so they can be removed by the auger. In some instances solid sand rock is encountered at less than 13 ft. Here the hole is drilled 18 in. into the rock and salt used to effect a low resistance contact. A 60-ft. scrap length of No. 4 or No. 2 bare copper is run down the pole and doubled back upon itself within the hole; the bottom end is curled up into an 8-in. elongated loop to increase the area of contact and anchorage. After it is bottomed in the hole 4 or 5 lb. of salt is mixed with fine clay and water and poured in alongside the wire.

In preparation for general improvement of system grounds by means of this new tool they have all been explored with a Borden "Groundometer" or "Evershed" ground megger. Over a period of three years grounds installed in the above manner to required depth have shown only slight seasonal variation and have an average trend toward lower ground resistance.



Two-section auger and drill for grounding holes

The auger is a standard coal miner's tool of Black Diamond medium tool steel welded to a length of ⅝-in. square rod of the same material. The drill was formed by a blacksmith. Each tool serves as the extension piece for the other. A brass chain keeps the cotter pins from being lost.

•

Checks Loading Before Xmas

Transformer failures and poor voltage regulation are being minimized by most companies by checking loads during the yearly peak, which usually occurs around Christmas. To avoid marring any illumination effects designed for the holiday period, to prepare for the increased domestic loads and minimize outages due to overloaded fuses, a series of such tests was conducted by the Rochester Gas & Electric Corporation three or four weeks before Christmas. Several overloaded transformers were replaced. The company finds that the reduction of transformer failures, voltage drop and loss of revenue from low voltage well repays the expense of the tests. But it considers that assuring and maintaining reliable service is a thing all customers appreciate.

Testing transformer loads to maintain high-grade service

The testing equipment used consisted of an a.c. ammeter connected by long leads with a split-core current transformer which could be clamped around the circuit so readings could be taken without making actual connections. Tests were made almost entirely at night by regular trouble crews and took about three weeks to complete along with regular trouble calls.

•

Lagging Simplifies Treating Furnace

By A. E. BELLIS
President
Bellis Heat Treating Company,
Branford, Conn.

Installation of heat insulation about a bank of three heat-treating pots at the Otis Elevator Company, Yonkers, N. Y., made compact arrangement and easy accessibility for operation possible. The furnaces use a lavite bath

For Continuity of Service

G-E Distribution Transformers with Self-contained Lightning Protection

ADDED FEATURES
New Mechanical Structures
New Clamp-terminal Bushings
New Tank Finishes

THEY LIMIT SURGE STRESSES

THE Thyrite bushing-arresters of the new G-E distribution transformer limit surge stresses imposed on the windings and insulation to only 25 to 35 per cent of the impulse strength of the transformer.

THEY HAVE HIGH IMPULSE STRENGTH

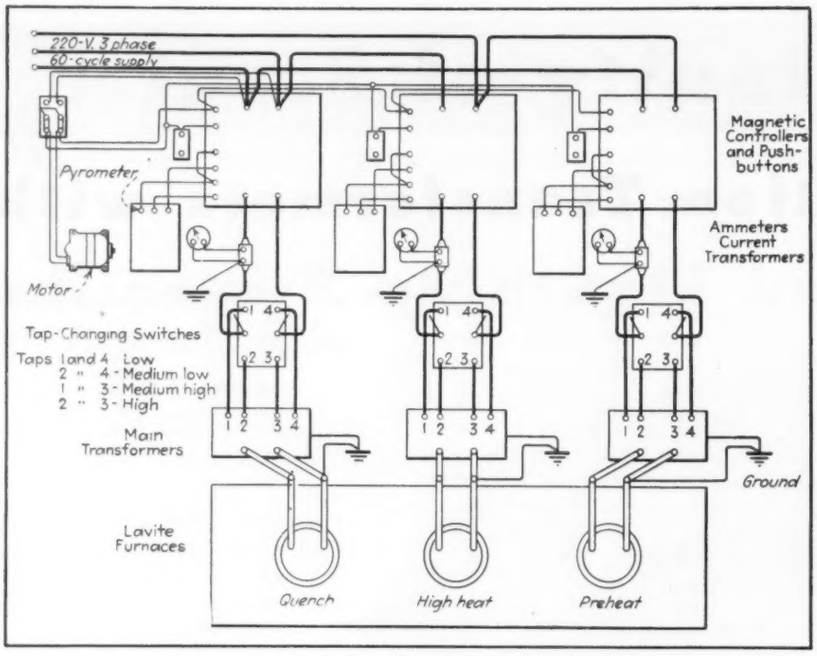
The new design results in a more uniform distribution of impulse stresses throughout the winding than has previously been obtained in distribution transformers. Furthermore, new insulations provide higher levels of dielectric strength.

The unit construction of arresters with transformers meets every requirement of modern lightning protection, helping to provide the highest standard of service; and reduces installation cost.

The new transformer is available in sizes 100 kv-a. and smaller, for 2400/4160 gr. Y- and 4800/8320 gr. Y-volt circuits. Ask for descriptive bulletin GEA-2077A. General Electric, Dept. 6C-201, Schenectady, N. Y.

300-21

GENERAL ELECTRIC



Heat insulation makes compact furnace layout

in which the heavy low-voltage current flows between an electrode immersed in the molten heating medium to the walls of the pot. The three pots of the triple unit furnace are placed in a large inclosure, made so as to provide very effective heat insulation. This insulation is important not only in conserving the heat and making close regulation possible, but also in making it possible to place the electrical apparatus close to the furnace. In the job under discussion the transformers supplied with each pot were placed about 18 in. back of the furnace.

The magnetic controllers were mounted on the wall back of the furnace and the control instrument, ammeter and push button for each of the three units were mounted on a panel near the furnace where the operator can easily reach it. The tap-changing switch, by means of which the intensity of heating is controlled, is on the primary side of the transformer and mounted where easily accessible.

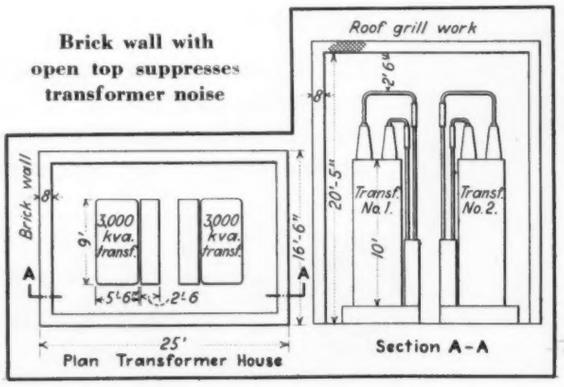
When installing the pyrometer it is important to prevent the thermocouple from touching either the electrode or the pot and to keep it insulated from the tube in which it is placed for protection, otherwise inaccurate temperature readings will result.

Wall Stops Transformer Noise

When a 3,000-kva. transformer was added to the Swampscott substation of the Lynn Gas & Electric Company complaint of noise was received from a residence diagonally in the rear of the lot and fronting on a street at a level 150 ft. above the substation area. Houses located within 50 ft. of the transformers had no complaints. James A. Cook, general manager of the company, stated that investigation showed the noise was not constant, but varied with the direction of the wind. Similar instances have shown that noise travels either through the air or sets up corresponding vibrations in houses and that these vibrations can be cured by mounting the transformers on special foundations isolated from surrounding structures.

In the Swampscott instance it appeared that the transmission of noise was through the air. Acting on this basis, the company built a four-wall brick structure around the transformers and carried it above the buses. No roof was provided, a grill being used at the top. Installation was made on the theory that the noise would be deflected upward and would pass over the adjacent houses. Two years of operation have proved the wisdom of the method.

Brick wall with open top suppresses transformer noise



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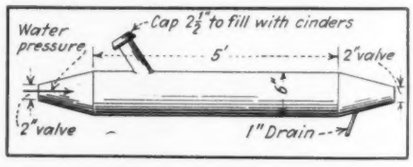
Cinders Clean Condenser

Periodic introduction of several hatfulls of crushed cinders into condenser circulating water, as a means of cleaning the tubes, is an expedient that appears startling on first consideration. Yet that is being done in at least two steam power plants in North Dakota, at Grand Forks and Minot. The circulating water at Minot contained an extraordinary quantity of mineral salts, particularly iron, that readily precipitated from the water. As a result the circulating water system became coated with iron deposits —fairly soft, not hard like scale.

How about shooting in chemicals to dissolve the stuff? That might be all right if the right prescription could be written, but probably a lot of chemical would be required and the cost would be prohibitive.

The device has been in use in Minot and Grand Forks for about a year now and no bad effects from the scouring of the cinders have yet been observed either in condenser or circulating water piping.



Gun for scouring condenser tubes

The cinder syringe used at Grand Forks, shown in the drawing, consists of 6-in. pipe with both ends tapered down to 2 in. The 6-in. section of the pipe is tapped near one end by a short piece of 2½-in. pipe and capped. Both tapered ends are fitted with valves and threaded nipples. With valves at both ends closed, the pipe is loaded with cinders sifted through a ¼-in. screen and the cap replaced. Then one end of the gun is screwed into the intake side of the circulating system, a high-pressure water connection made to the other end, and the two valves opened. The water forces the cinders into the condenser chamber where they are picked up by the circulating water and carried through the condenser tubes and discharged.

Two New G-E Cable Compounds

VERSATOL and CORONOL

For Any Job Where Rubber Cable Is Desired

VERSATOL
An All-purpose Cable Insulation

Versatol is another result of General Electric's long-continuing research in the field of insulating compounds for cable.

It is new—new in the sense that G-E engineers have at last succeeded in combining in one compound all the essentials of various other good insulations. These essentials are:

Long life
Heat resistance
Moisture resistance

When you want a high-quality rubber-insulated cable with these characteristics, specify Versatol.

Long-aging—Versatol is a Performite compound. It passes the 504-hour oxygen-bomb test, proving its superaging qualities.

Heat-resisting—Cable insulated with Versatol can be operated at a copper temperature of 75 deg. C., as compared with 50 or 60 deg. C. for other rubber compounds. The chief advantage is that for a given current-carrying capacity a smaller-size conductor can be used.

Moisture-resisting—Versatol has an unusually low moisture-absorption factor—0.010 gram per sq. in., proving that it is extremely moisture-resisting. This, plus its long-aging quality, makes Versatol the first choice for nonleaded submarine cable, for braided cable in wet conduit, and for similar applications.

CORONOL
A High-voltage Cable Insulation

Coronol is an insulating compound that has proved unusually desirable for high-voltage (up to 15 kv.) cable applications. This insulation is not only highly resistant to ozone, but it also has high dielectric strength and good heat-resisting qualities. Its moisture-absorption factor is nearly as low as that of Versatol—0.02 gram per sq. in.

These Two Compounds Will Fit Most Jobs

Either Versatol or Coronol will meet all requirements for high-quality insulation for all types of cable that fall in the rubber-like-insulated class.

For detailed specifications see the following publications:
GEA-1788, "Coronol" GEA-2110, "Versatol"
Copies of these may be obtained from the nearest G-E sales office; or write direct to General Electric Company, Dept. 6A-201, Schenectady, New York.

ALL TYPES OF COMPOUNDS

In addition to Versatol and Coronol, General Electric can furnish cable insulated with any standard, Performite, or special compound.

So far as quality goes, they fall roughly into three broad classes: ordinary grade, which is typified by Code rubber; next-better grade, such as 30-per-cent A.S.T.M. Class AO; and third, the Performite and special grades.

For complete information, see Bulletin GEA-2113, "Cable Compounds." For a copy address the nearest G-E sales office or General Electric, Schenectady, New York.

NEW Book on Paper Cable

The latest edition of our bulletin on paper-insulated cable (GEA-1278B), now off the press, describes four major improvements—compack-strand conductor, paper insulation applied in graduated layers, treatment with CO_2 gas, and G-E hydrogen-processed lead sheath.

The four general types of paper-insulated cable—oil-filled, shielded Type H, nonshielded, and Pyranol—are described in detail, and insulation thickness and other data are included. This bulletin is up to date in every respect. If you would like a copy, address the nearest G-E sales office, or General Electric, Dept. 6A-201, Schenectady, New York.

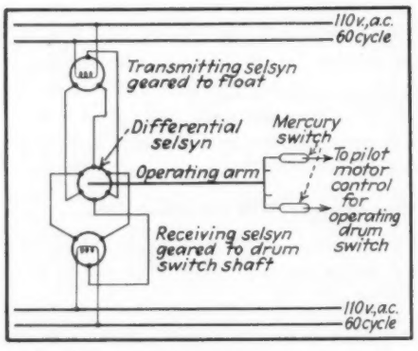
520-42

GENERAL ELECTRIC

Simple Plan Holds High Power Factor

By EUSTACE C. SOARES
The R. B. Engineering Corporation, New York

In a large industrial plant containing one 3,750-kw. and one 2,500-kw. steam-turbine generating units the synchronous motors in the plant were arranged to adjust automatically for lagging power factor and thus improve voltage regulation on the system. The plant contained three 750-hp., 225-r.p.m. and two 150-hp., 257-r.p.m. synchronous motors. The rest of the plant load consisted of lighting load (about 75 kw.) and a large number of induction motors ranging from 75 hp. down. All of the equipment was started directly across the line.



Fields of synchronous motors and alternators connected to same bus

When the installation was designed the direct-current bus was arranged so that it could be separated to give an alternator exciter bus supplied by an exciter operating through the voltage regulator and a synchronous motor bus supplied by a separate exciter. This method of operation, however, has never been found necessary since the method described has proved its merits over a long period of operation.

The exciters supplying the generator fields were connected to a common bus and operated in conjunction with a vibrating-type voltage regulator. All the synchronous motors had their fields designed to operate at full-load unity power factor at approximately 100 volts and were connected to the same exciter bus. The load is fairly constant and the plant operates 24 hours daily with the large synchronous motors started only two or three times a week under normal operation. Two of these are operated continuously in the summer and one in the winter, although once a week each unit is shut down for inspection. When the plant is operating and all synchronous motor field rheostats have been set to give a slightly leading power factor, any increase in load, which is virtually always a lagging power factor load, causes an increase in exciter voltage, which automatically increases the leading current furnished by the synchronous motors on the line and thus maintains the plant power factor.

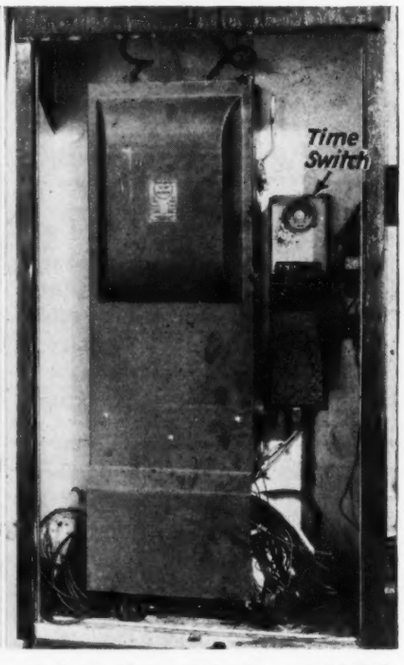
If a large synchronous motor is started the voltage regulator increases the exciter voltage sufficiently to permit a large percentage of the lagging current to be counterbalanced by the high leading current automatically supplied by the other synchronous motors which are operating. Therefore, the generator is not called upon to supply all the lagging current required by the synchronous motor being started. Occasionally the synchronous motor-field rheostats must be adjusted to meet a new general plant load condition, but this is only required about four times daily.

•

Electric Vibrator for Concrete

Electric power is used in a novel method developed in Great Britain for consolidating and bonding concrete to structural steel by means of a vibrator. This consists of a motor and vibrating head carried on a welded frame, fitted with clamps so that the machine can be clamped to the steel structure. The 3-hp. driving motor gives sufficient

Time Switch Fixes Oil Production

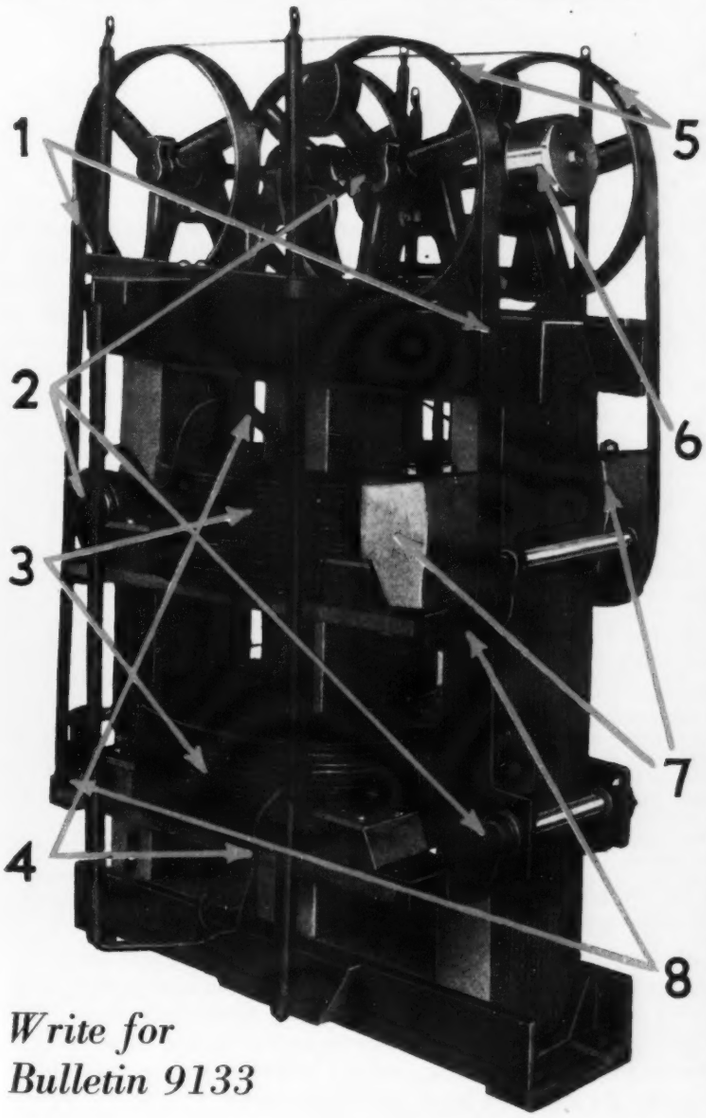


Governmental regulation of how much and how fast oil can be taken from the ground has opened up an entirely new field for electric time switches, pointed out G. H. Weckel, Kansas Gas & Electric Company, at the Petroleum Electric Power Club recently, in Beaumont, Tex. The Kansas well shown is equipped with a Westinghouse geared pumping unit having a 9/16/25-hp. motor. Attached to the service pole in the background is the cabinet containing the control devices, including an across-the-line starter and the time switch. To the right of the latter is a small air-cooled transformer for supplying lights from the 440-volt circuit.

CONSTANT CURRENT MOLONEY

STREET LIGHTING TRANSFORMERS

POLE—SUBWAY—AND STATION TYPE



Write for Bulletin 9133

MOLONEY CONSTANT CURRENT STREET LIGHTING TRANSFORMERS, by their excellence of performance and continuity of service, have gained the recognition and admiration of the industry. High grade materials combined with accurate workmanship and precision designing account for the rugged construction and efficient performance of these transformers.

Bulletin 9133 gives complete details. Following are some of the advantages offered: Regulation entirely automatic and instantaneous in action. No taps or adjustment necessary to maintain constant current from full load to short circuit. Transformers when operating with primary voltage between 2200 and 2400 volts, 60 cycle frequency and with rated lamp capacity load, will regulate between one percent plus or minus of rated secondary current. No attention required after proper installation. Control panels and services of an attendant eliminated. High repulsion of moving coil minimizes lamp failures caused by primary line surges. Mechanism and coils submerged in oil encased in weather-proof tank. Primary power factor 60 percent higher than for stationary coil regulator, being 80 percent at maximum load. Efficiency nearly equal to that of station type regulator. Double moving coil design lowers the kinetic energy of coils, practically eliminating force on the bumpers during short circuits.

MOLONEY ELECTRIC COMPANY
ST. LOUIS, MO.

● View of Type SL pole type core and coil assembly showing the coils partially open. This position corresponds to approximately half load.

1. Nickel steel bands are fastened to the moving ends of each coil.
2. All shafts are fitted with precision ball bearings to eliminate friction.
3. The primary and secondary coils are always parallel with this new design. This double coil movement gives high Power Factor and low primary current.
4. Extra flexible leads are used to eliminate sluggish movement of the coils.
5. Pulley wheels are provided for nickel steel bands. The bands are fastened to the wheels at these points.
6. Weights with Vernier to set for accurate adjustment. This is accessible and convenient.
7. Loading weights which balance the forces of repulsion at various loads.
8. Moving ends of primary and secondary coils to which steel bands are fastened.

power to set into vibration an 18-in. steel girder. The motor is spring suspended and drives an eccentric weight at 3,600 r.p.m. about an axis parallel with the structural member to which it is clamped. Rapid rotation of the eccentric weight produces the required vibration. An adjustable eccentric disk is fitted to regulate the degree of vibration to suit the size and weight of any beam from 6 to 18 in. wide. No special precautions or preparations are made. The concrete is dumped fairly evenly on the floor and operating the vibrator for fifteen seconds is sufficient to spread it.

Prior to its use ten to twelve workmen were employed in running 500 to 600 yd. of concrete a day. With the vibrator, the same amount of work was done by one skilled mechanic and four laborers.

•

Selsyn Control for Cooling Water

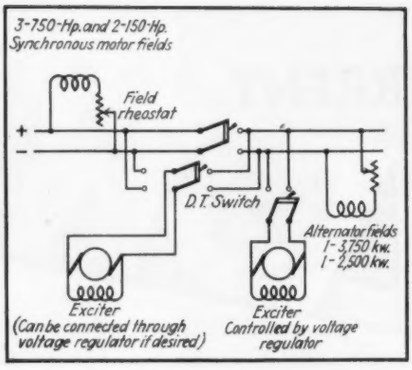
In a large California industrial plant modern electrical control was called upon to solve a difficult operating problem involving both the water supply system and plant structure. Cooling water for the process vacuum pans is subject to wide and rapidly fluctuating demand. Manual control of the battery of large centrifugal pumps, although used for many years, proved unsatisfactory because the attendant could not start and stop the units fast enough to maintain close control of the cooling water. Even installation of a large number of storage tanks on top of the building, to smooth out fluctuations in supply, was not satisfactory because their weight had to be superimposed upon the already overloaded building structure. Investigation of electrical control showed that General Electric "Selsyn" control could be adapted to the requirements and eliminate all but one of the large elevated tanks.

A small transmitting selsyn motor is connected by chain and sprocket to a float in the standpipe. The receiving selsyn motor is located at the pump control. As the water level in the standpipe changes the rotor of the transmitting selsyn is turned to a corresponding position. But the receiving selsyn, geared to the drum switch, cannot assume a position corresponding to that of the transmitting selsyn. The phase differential thereby established is impressed on a differential selsyn connected between the transmitting and receiving selsyns. The differential rotor, being free to turn, assumes a position that will compensate for the phase difference between the rotors of the transmitting and receiving selsyns and actuates a set of mercury switches. If the level in the standpipe is falling, a mercury switch energizes the "forward" contactor of the pilot motor driving the master drum switch and establishes a holding circuit for the contactor through an interlock. With rising water the "reverse" contactor is actuated by the other mercury switch.

The master drum switch closes and opens circuits and contactors in accordance with a predetermined order of stopping and starting the various pump motors and opening and closing associated valves. As soon as the second point on the master switch is reached a "positioning" cam opens and drops out the forward contactors, stopping the pilot motor. A solenoid brake on the master switch keeps it from rotating when the pilot motor is not energized.

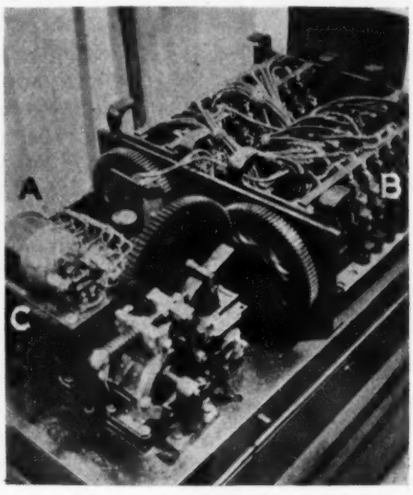
Consequently, as the demand for cooling water increases and the standpipe water level falls, the selsyn control indirectly starts additional motors and opens the associated pump valves, one at a time, until the standpipe level ceases to fall. When the demand for cooling water falls off the reverse operation occurs.

This method of control has proved very simple, positive and reliable. One of its greatest advantages is the fact that it was necessary to install only three small control wires from the control apparatus in the basement to the standpipe on the roof. As the selsyns are energized from 110 volts a.c., the conventional supply circuit could be used. No oscillation in the control has been noted because of the high-torque characteristics of the selsyns. In case of power failures, the control system is self-synchronizing and will return to the correct position automatically as soon as service is restored. Not only has the control circuit eliminated a pump attendant, but, also, it has provided a much more accurate control for the cooling water, with the consequent improvement in product of the plant.



Schematic diagram of selsyn control

Rotor of transmitting selsyn geared by chain to float in standpipe. Rotor of receiver geared to master switch. Torque set up by phase differences of two selsyns moves rotor of differential selsyn and level indicator also. This actuates mercury switches on the differential gear to change the position of the drum switch.



Receiving end of control system

A—Differential selsyn operating on phase differential between transmitting and receiving selsyn geared to shaft of drum switch. B—Motor-driven drum-type master switch which opens and closes valves. C—Pilot motor driving drum switch.

•

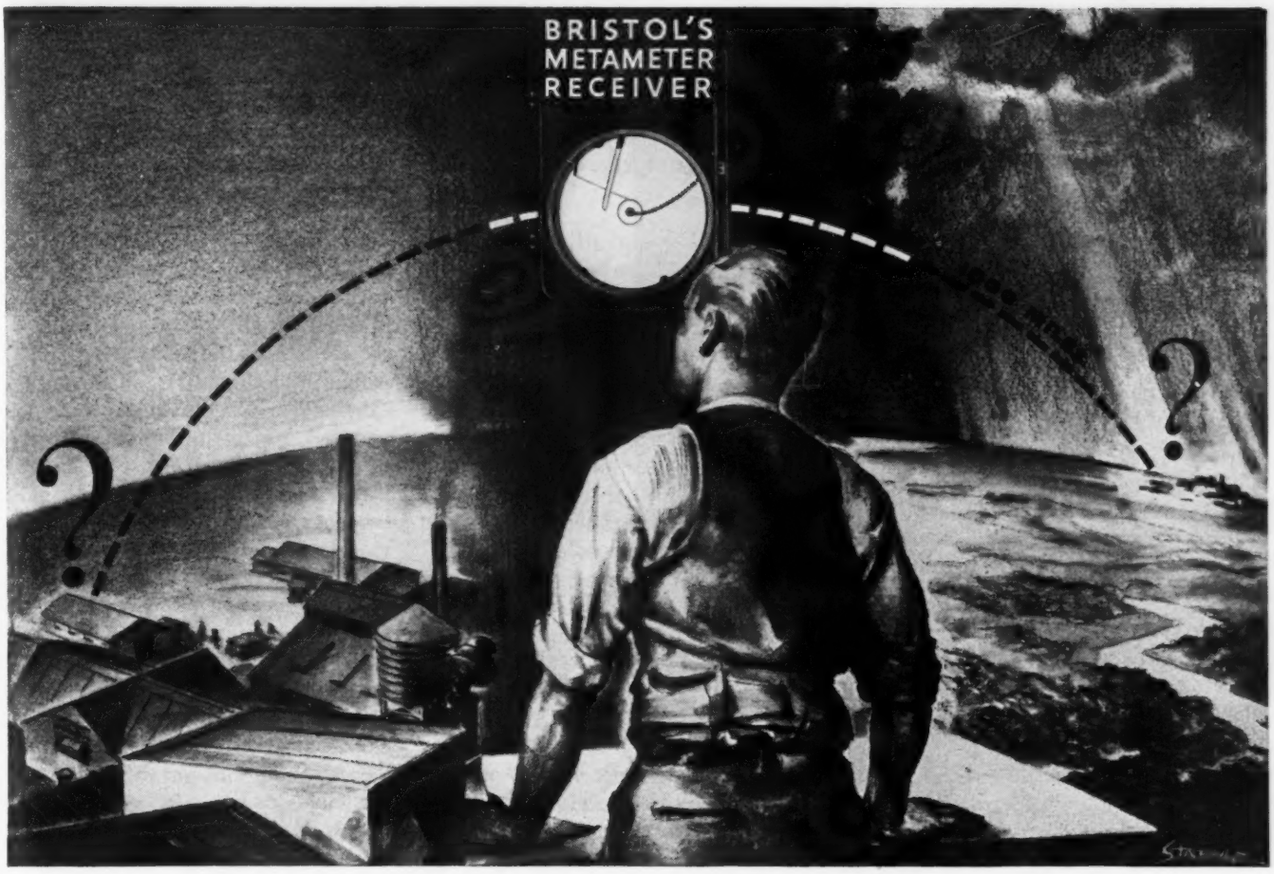
Multi-Coupled Induction Motors

By FRED CLAYTON
Nashville, Tenn.

Failure of a 70-hp. motor to arrive when the plant of the Gulf Lumber Company was ready to operate necessitated the coupling of two available 35-hp. induction motors to take its place as drive for a large timber sizer. These motors, solidly coupled to the main shaft from which the cutting heads and cylinder were belted, had identical characteristics and nameplate ratings and were readily handled by a single compensator, thanks to the generous overload capacity of the power supply.

Subsequent rearranging of the planing mill in this plant made several additional 35-hp. motors available. These motors were mechanically coupled to drive a number of the more heavily loaded machines, which had used single-motor drives. The machines operated successfully in this manner for a number of years.

Multi-coupling of this type has the advantage that it permits the removal and repair of one of the motors while the remaining motor can drive the machine for short light-load periods, or for running adjustments. With single-motor drive motor failure completely ties up the machine to which it is connected while repairs or replacements are being made.



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Concrete Service Wye Devised

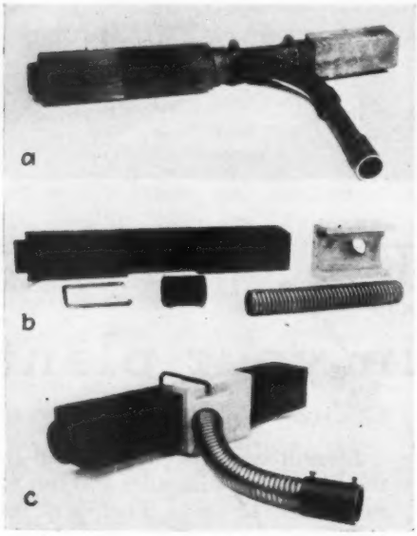
By J. RUSSO
Assistant Engineer,
Brooklyn Edison Company

A new design of concrete service wye to be used with flexible galvanized tubing has been developed in Brooklyn in order to eliminate as many as possible of the disadvantages of the split cast-iron service wye and to simplify the installation.

Use of the concrete wye eliminates the necessity for butt joints previously used because an opening 1¼ in. deep by 7½ in. long in the side of the duct is the only work required on the duct to install a service wye. This construction makes it possible to install a continuous duct whose sections are held together by machined mortise and tenon joints and results in a rigid duct line which cannot be forced out of alignment by tamping or settling of the backfill. The concrete device is designed to lap all edges of the opening so that no earth will enter the duct and only ordinary care need be exercised in cutting the opening. The top surface of the wye is sloped so that a wrought iron yoke used to fasten the wye to the duct is driven into position with a hammer, thereby eliminating the use of bolts, nuts and a wrench, which are rather awkward to handle in a restricted space in the trench, especially in cold weather.

To install a service wye on a service duct containing cables the same procedure is followed as is required for an empty duct except that care must be taken to avoid injury to the cables. It is unnecessary, therefore, to remove the entire duct from around the cables and to resort to split duct as was required in the case of the cast-iron wye.

The concrete wye has been found useful as an insulating joint to avoid electrolysis on cables with grounded lead sheaths in the service duct and the service pipe fastened to a steel elevated railway structure by using non-metallic sheath cable in the service pipe.



New service wye saves half of installation cost

(a) Previous standard design of wye.
(b) Wood duct has opening for insertion of concrete wye member. Yoke, slip coupling and flexible conduit comprise the elements. Flexible conduit affords the bend and permits considerable variation in levels of service pipe and service duct.
(c) Construction procedure simplified, strength improved, saving afforded.

•

Keeping Farm Lines Cheap

By V. C. PRICE
Distribution Engineer,
Iowa Southern Utilities Company,
Centerville*

Almost every distribution engineer has some pet ideas and schemes for building farm lines, but in the long run the final costs per consumer do not vary much after all. We have tried some vertical single-phase construction, placing the phase wire on a ridge pin and the neutral on a spool on the side of the pole, but the actual savings are negligible and the old crossarm line is still about as practical as any. It is a fact, however, that where a line must be carried through trees a vertical slit in the foliage is a lot easier to maintain than a horizontal one.

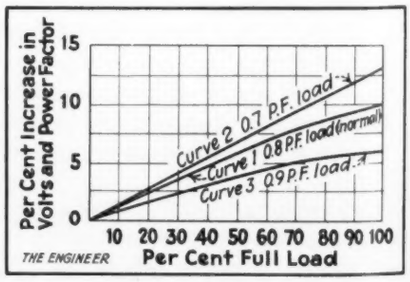
Along with all others interested in rural lines, we are endeavoring to string the spans out as far as safety will permit. Another scheme of ours is to buy 6,900-volt transformers with the series parallel arrangement in the primary so that they can be used on existing 2,300-volt lines and later changed to 6,900 volts without replacement. We are also leaning toward the quickly replaceable clamp bushings, since maintenance is obviously much easier. However, when one considers that the average overall investment per urban customer is something more than $500, and that in rural areas here in the Middle West only about 2½ to three customers can be obtained per mile, not many frills can be justified on a rural line unless the consumption can be built up to great heights.

*From paper to Missouri Valley Electric Association.

•

Voltage Booster Employs Capacitor

Employing the principle of voltage boost by series capacitance is a new device whose transformer primary is in series with the line and whose secondary has a condenser across its terminals. It is a British apparatus described in the *Engineer* of March 1, 1935. It has no moving parts except contacts, which are normally fixed, but can be moved to predetermined values of boost at full load. With this form of automatic regulation any percentage boost is always accompanied by an identical percentage improvement in power factor. Thus, a 10 per cent voltage boost will raise 0.80 power


Per Cent Increase in Volts and Power Factor
15
10
5
0
Curve 2 0.7 P.F. load
Curve 1 0.8 P.F. load (normal)
Curve 3 0.9 P.F. load
10 20 30 40 50 60 70 80 90 100
Per Cent Full Load
THE ENGINEER

Boost effect varies with load and power factor

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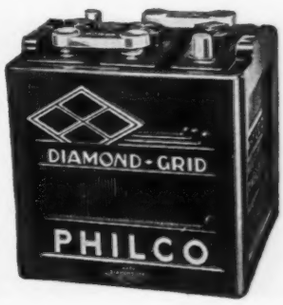

PHILCO, Battery Division, Tioga and C Streets, Philadelphia, Penna.

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factor to 0.88 because of the corrective effect of the reactive-kva. introduced by the capacitor. Likewise, the degree of boost attained is dependent on the load power factor, as can be seen from the illustration reproduced from the article, a lesser boost being obtained at better power factor than that for which the device is designed or set. Otherwise the degree of boost is practically proportional to the magnitude of load for any fixed value of power factor.

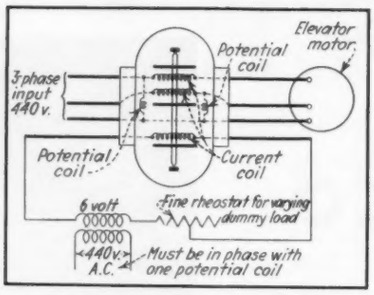
The various taps provided (customarily for 90, 80 and 70 per cent of maximum) may also be used to adjust the booster for use on a load having a power factor differing from that for which it was originally designed. The makers, British Electric Transformer Company, point out that the device inherently corrects for flicker.

•

Power Meter Solves Production Problem

In a large California sugar refinery the mill output was budgeted at 2,000 tons per day. It was impossible to determine the actual rate of production until the refined sugar reports came in at the end of the ten-day continuous 24-hour operating period. This proved very unsatisfactory because the resulting average daily production missed the budgeted amount by wide margins practically all of the time.

An analysis was made to see if it was possible to measure accurately the input of raw material to the plant. At the beginning of the process the raw sugar is elevated about 80 ft. by a pair of chain bucket elevators. These elevators are driven by a pair of three-phase induction motors. No-load demand of the elevators was constant.



Standard three-element watt-hour meter arranged to check and control production

One current coil is connected in reverse to a dummy load to balance input losses when machine runs unloaded. In operation the elevators are run idle for fifteen minutes during each eight-hour shift while certain other equipment is washed down. At this time the balance of the dummy load is checked against the no-load power demand of the motors. This adjustment rarely needs changing. As an added convenience an indicating meter also is connected into the circuit to read the actual tons passing per hour, these hourly readings being checked by the integrators of the standard kilowatt-hour meters.

Because of this condition a three-phase, three-element watt-hour meter was selected as a measuring device. One such meter was connected into each of the motor circuits (see illustration). The current coil of each meter was connected in reverse to a finely adjustable dummy load; the dummy load was set exactly to balance the no-load demand of the motor, and thus, when operating unloaded, the meter would not turn.

As material was loaded into the elevators, the power used in useful work alone therefore was registered by the meter. The reading in kilowatt-hours being directly proportional to the tons of material elevated, it was possible to calibrate the meter to read in total tons instead of the conventional kilowatt-hour scale.

The device has proved extremely practical, the input of raw sugar registered by the meter checking within 2 per cent of the refined output over a ten-day period.

•

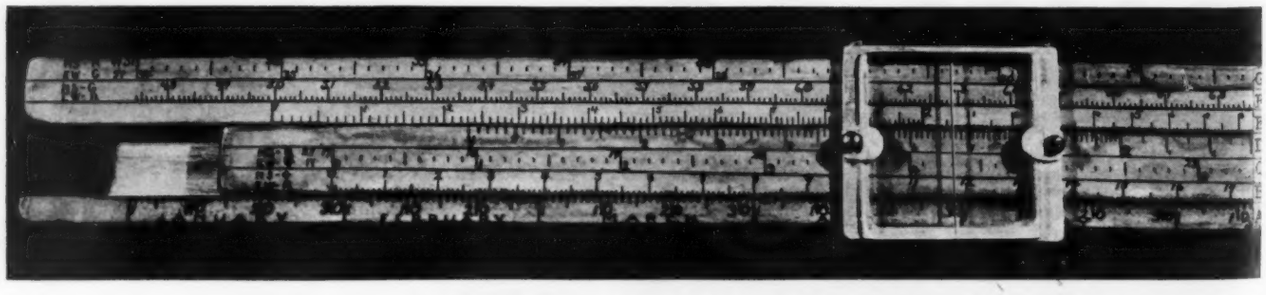
Traffic Lamp Time Found by Slide Rule

By HARRY A. SMITH
New York Edison Company

Determination of the burning hours of traffic lamps is facilitated by a slide rule specially designed for the purpose. A separate card is used for each lamp. Actual burning hours are to be ascertained and recorded to simplify the maintenance technique of these lamps.

In each unit there are eight individual lamps, red and green, facing in four directions. Four lamps are on longer than the other four, since the north- and south-bound traffic is given preference over the east and west. There are three variables—*i.e.*, the elapsed time in days, the two different burning times in a single unit and the different burning cycles at various locations. Present traffic conditions require about 100 different burning cycles. The cycle that is used most frequently was chosen as a basis. Variations from this basic time are recorded on the cards as multiplying constants.

The life of a lamp is figured by placing the zero point of the hour scale, B or C, over the date of installation, A, and the hair line over the date of failure, A. The hours are read under the hair line, using the proper scale, B or C, for the particular lamp that is being figured. The reading obtained is that of the basic cycle and must be multiplied by the constant for the actual cycle.



Slide rule computes life of traffic lamps

The slide rule is composed of seven scales. The lowest, scale A, is composed of the months and days of the year. Directly above, on the movable slide, are three scales, B, C and D. The first two, B and C, are graduated in ten-hour divisions. Two scales are necessary, one for the lamps that are burning when the north- and south-bound traffic is moving and the other for the east and west. The third, scale D, on the movable slide and the first scale, E, on the stationary part of the rule are regular logarithmic scales. Above these are two more, F and G, which are continuations of scales B and C, and are used for periods up to four years.

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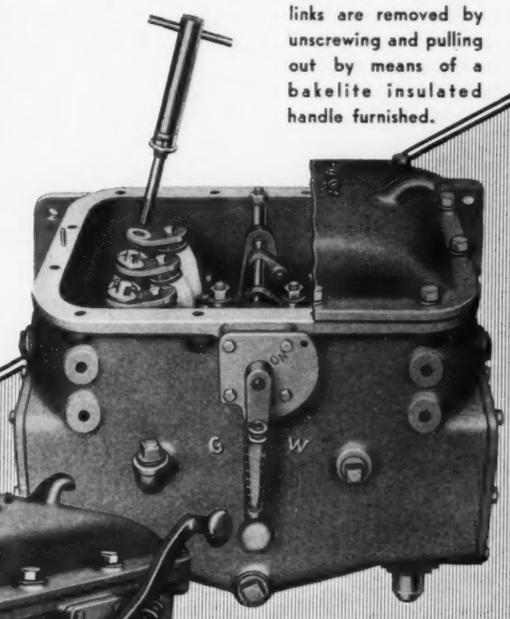
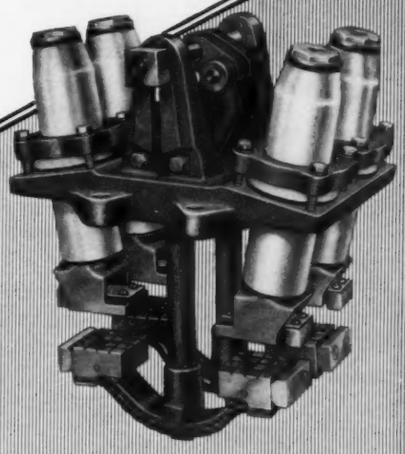
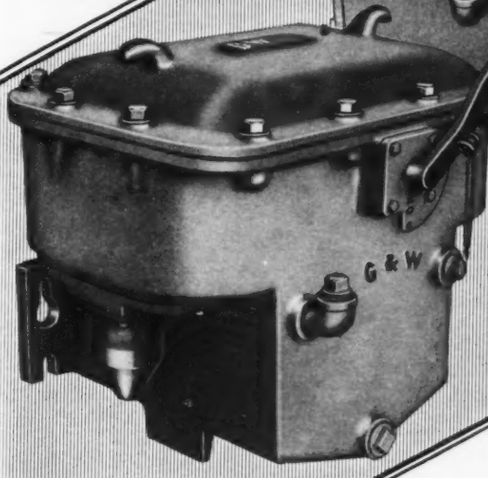
Type "KL" air break links are removed by unscrewing and pulling out by means of a bakelite insulated handle furnished.



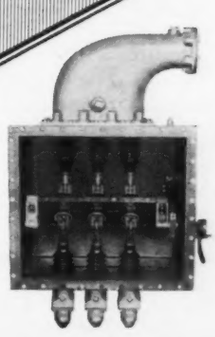
TYPE "KL" SWITCH
7500 Volts, 300 Amp.
COMBINATION
OIL & AIR
BREAK



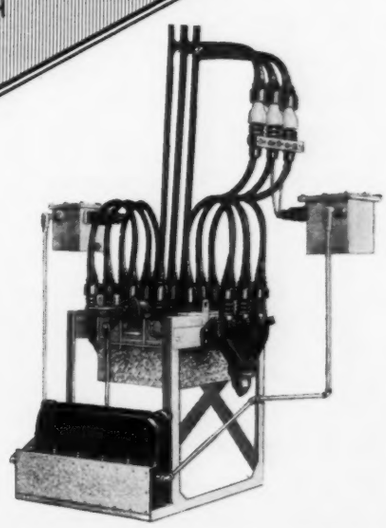
UNIT DETACHABLE SWITCH UNIT FOR TYPE "K" & "KL"



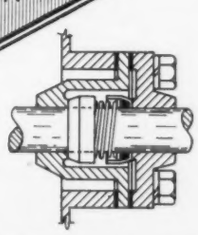
TYPE "K" SWITCH
7500 V., 300 AMP.
OIL BREAK
ONE PIECE
TANK



Type "GD" Grounding and Disconnecting Switch. Also furnished for direct attachment to transformers.



Type "DT" Automatic Transfer Switch helps eliminate service interruptions by automatically controlling duplicate feeds.



Cooke Oil Seal Ring is used to seal shafts on all G & W Oil Switches.

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7780 Dante Avenue, Chicago • • • • Representatives in Principal Cities

Do Your Employees Cook Electrically?

These saturation figures from 20 power companies show that this influence of a good example can be capitalized.

The success of the Niagara Hudson Power Company and the Northern States Power Company in developing a high saturation of electric ranges among company employees suggested that a check-up of a list of prominent companies would be interesting. It seems self-evident that if the public is to be impressed with the advantages of electric cooking, electrical men themselves must believe in it and set a good example. A report was secured from 60-odd utilities.

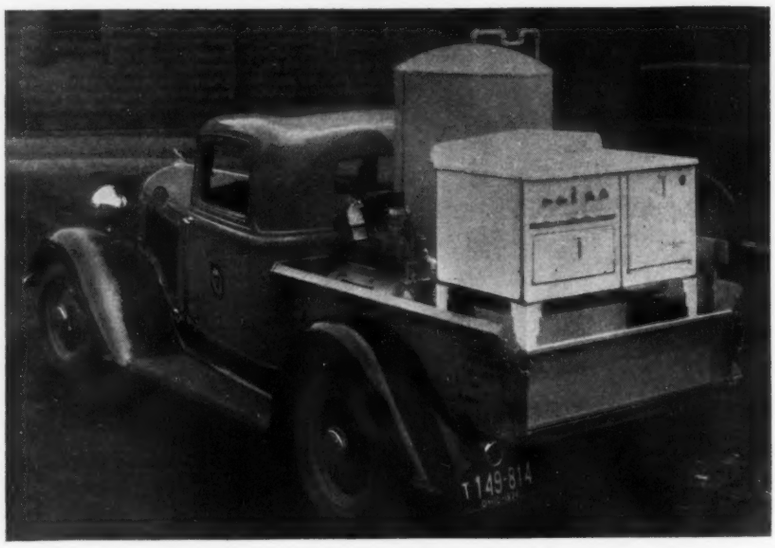
In 27 cases heard from, because the company operated a competing gas service in all or part of its territory or because cheap natural gas was available, no effort had been made to interest employees in the electric range.

In thirteen cases there are no data available. But the companies shown in the accompanying table reported their saturation. It is recorded on several bases, because that was the way the local check-up had been made.

A saturation of 50 and 60 per cent of all employees, of 75 and 85 per cent of those receiving $200 a month salary and of 60 and 70 per cent of all employee families shows what progress can be made. As one company puts it:

> It has been our practice, on all new equipment that comes out, to stage our early campaigns among our own employees. We do this for several reasons; first, it gives us an opportunity to test out the market, and, second, an opportunity to enlist the aid of our employees in the sale of the idea to our customers.

After all, the cobbler's children *should* wear shoes. It makes bad publicity if they don't, and good advertising if they do. Therefore some companies have assigned definite salesmen to the upbuilding of employee load.



Demonstration outfit used by rural salesmen on Dayton system

Dayton Rents Rural Equipment

Last year approximately 300 electric ranges and electric water heaters were placed on rental in rural and suburban homes throughout the territory served by the Dayton Power & Light Company. During May and June, at the beginning of the hot weather season, nearly 150 units had been so placed, or exactly double the number sold outright during all of the previous year. The full year showed an increase of 400 per cent. Sales

Saturation of Electric Ranges Among Power Company Employees

Name	% of All	Per Cent Over $200 Month	Per Cent Employees' Families
Southern Colo. Power Co., Pueblo	52	..	..
Edison Elec. Ill. Co., Brockton	63	..	70
Ohio Edison Co., Akron	35	85	..
Tampa Elec. Co.	37	..	..
Duke Power Co., Charlotte	55	..	..
West Penn. Pwr. Co., Pittsburgh	32	..	..
So. Carolina Pwr. Co., Charleston	19	..	..
Potomac Edison Co., Hagerstown	45	..	..
No. Dakota Pwr. & Lt. Co., Bismarck	25	..	51
Kansas Elec. Pwr. Co., Lawrence	..	71	..
Oklahoma Gas & Elec. Co., Okla. City	..	85	..
Birmingham Elec. Co., Birmingham, Ala.	15	..	..
Kansas Gas & Elec. Co., Wichita	21	..	..
El Paso Elec. Co.	28	75	..
Hartford Elec. Lt. Co.	53	87	..
Western Massachusetts Co., Springfield	..	..	45
Northwestern Elec. Co., Portland	..	..	60
So. Calif. Edison Co., Los Angeles	55	..	..
Niagara Hudson Pwr. Co., Buffalo	..	87	..
Northern States Pwr. Co., Minneapolis	..	..	79
Cumberland County Pwr. & Lt. Co., Portland	27	..	..
New England Gas & Elec. Assn.	44	..	..
Kentucky Utilities Co., Lexington	46	..	..
Pacific Power & Light Company, Portland	67	..	..
Interstate Power Co., Dubuque	69	..	..
Monongahela West Penn Pub. Serv., Fairmont	23	..	..
Gloucester Electric Co.	..	25	..
Haverhill Electric Co.	..	44	..

The same friction, by which the Indian created a flame, caused the easy ignition of the first Friction Match made by the Frenchman, Dr. Chas. Sauria in 1831 . . . . This was a basic discovery that we still use today. But how obsolete a smudging flame now seems, in contrast with the immaculate cleanliness of Electric Heat. Mankind has an innate sense of cleanliness in relation to his food. Hence, the ever increasing demand for the Electric Range with ever growing revenue for the power companies which now get $130,000,000 annually from the domestic heating load . . . This was all made possible by A. L. Marsh in 1906, when he discovered Chromel, the wire that made electric heat possible. Heating elements of Chromel have the deserved confidence of the device maker and user. When you as an engineer recommend Chromel; or as a user, accept Chromel—your judgment is sound. Hoskins Manufacturing Co., Detroit, Mich.

H O S K I N S

CHROMEL

THE *wire* THAT MADE ELECTRIC HEAT POSSIBLE

were made out of a special rural salesman's truck which carried a range, a water heater and a water pump unit right to the customer's yard for demonstration.

Ranges are placed in the farm home for a monthly payment of $1.50 and the water heater for $1.75. Range payments run for five years, the water heater 5½ years. And the fact that the contract may be dropped at any time helps close many contracts. The Dayton company has eight rural salesmen selling in this manner. Most of the contracts are closed on the second call.

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Industrial Self-Survey Effective

For the past nine months Public Service Electric & Gas Company of New Jersey has been employing an industrial self-survey book in stimulating power users to check up on possibilities for reducing the costs and increasing the profits. This book, entitled "106 Check Points for Greater Plant Efficiency," lists a series of classified questions which, carefully analyzed in light of each plant's problems, furnish a guide to more efficient operation. It embraces plant layout, materials handled, preventive maintenance, possibilities for expansion and a wide range of practical present-day plant problems.

Questions are printed on 8½x11-in. sheets, with space left for comments which the plant manager will make for his own information and guidance. Demand for the book has been developed by newspaper advertising and publicity, discussion before engineering and business groups. About 2,000 have been distributed so far and resulted in a great many cases of closer contact and improved relations with power customers and prospects. In all, 24 power companies are now using this system of approach.

HOW MRS. STOOPOVER LOST HER BACKACHE
..NOW SHE HAS
PLENTY OF ELECTRIC OUTLETS IN EVERY ROOM
UNDER the Better Housing Program the banks will lend to responsible home-owners and lessees amounts up to $3000 for home improvements, on easy terms. Now's the time to install those outlets you've needed, or treat yourself to automatic heat, new lighting fixtures, wall switches and other electrical improvements you've long hankered for. See us for "How-to-do-it" information.
MODERNIZE your home ELECTRICALLY
UNDER THE BETTER HOUSING PROGRAM
LOCAL ELECTRIC COMPANY NAME

The advertising of the New York City power companies is tying adequate wiring into the Better Housing Program. This one strikes a good note.

•

Hay Fever Bows to Air Conditioning

Relief in fifteen minutes is the experience of hay-fever victims in a room conditioned with a new Westinghouse pollen and dust extractor being tried out in Pittsburgh. A 50-watt device of electrostatic nature first ionizes the particles in the air, collects them on the oiled surfaces of oppositely charged plates, whence they can be flushed off at intervals. Progress not to be sneezed at.

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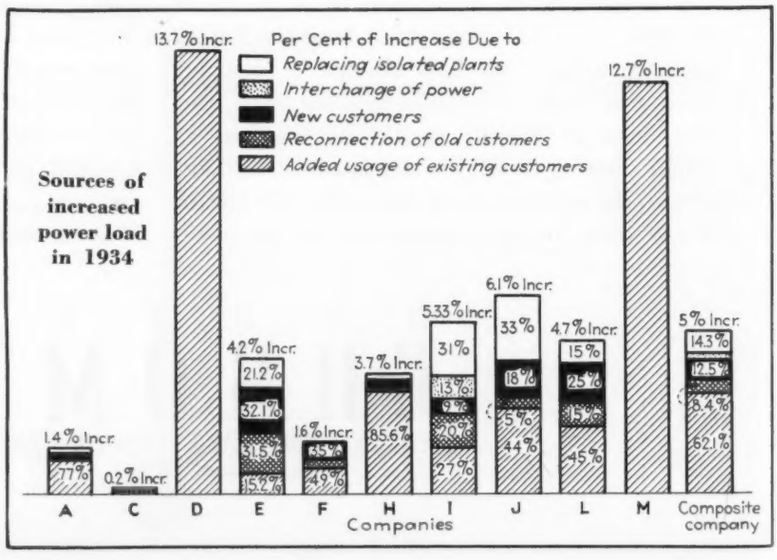
Best Power Prospects Existing Customers

By R. D. HAYES
Middle West Utilities Company, Chicago, Ill.

Indication that existing customers constitute the most fertile field in which to cultivate additional power revenue appears from the accompanying chart constructed from figures published in ELECTRICAL WORLD.* Ten utility companies (names not given) showed the electrical consumptions taken by various sources of increased load in 1934.

A composite company calculated from this group of ten showed a total increase in kilowatt-hours equal to 5 per cent of the 1933 consumption. Of this, 14.3 per cent came from replacing isolated plants; a very small portion was added through customers; 8.4 per cent was due to the reconnection of old customers; 62.1 per cent of the increase was from added usage of existing power customers. The two companies which made the best showing, increasing their kilowatt-hours from industrial power by 13.7 and 12.7 per cent, respectively, obtained 100 per cent of this business from existing customers. In most cases it requires very little new money to take on business of this kind, and especial attention should be paid to it.

*January 5, 1935.



MEN OF THE INDUSTRY

R. B. Baxter Heads Electrical Association

R. B. Baxter, managing director of the Montreal Engineering Company, Ltd., and vice-president of Calgary Power Company, Ltd., Calgary, Alberta, Canada, has been elected president of the Canadian Electrical Association for 1935-36. Connected with the utility business continuously since 1905, Mr. Baxter has held positions as plant and construction superintendent, chief engineer and general manager of Alberta Telephones, general manager Calgary Power Company, Ltd., and as managing director Montreal Engineering Company, Ltd.

R. B. Baxter

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▶ ALEX DOW, president of the Detroit Edison Company, was the recipient of an honorary doctor of science degree conferred by the University of Detroit at the recent commencement.

▶ WILLIAM H. MEESE, vice-president of the Western Electric Company and works manager of its Point Breeze Plant in Baltimore, was the recipient recently of two honorary degrees conferred in recognition of his professional attainments and conspicuous civic leadership in Baltimore. The University of Michigan, Mr. Meese's alma mater, awarded him the degree of master of engineering, while Temple University presented him with the degree of doctor of science.

▶ DR. IRVING LANGMUIR, associate director of the General Electric Research Laboratory at Schenectady, has been elected to foreign membership in the Royal Society, England. Considered one of the highest honors that can be bestowed by British scientists on fellow workers in other countries, membership is limited to 50 persons throughout the world. Dr. Langmuir was also made the recipient of the Holley Medal for 1934, awarded on June 20 at the semi-annual meeting of the American Society of Mechanical Engineers at Cincinnati. The award was made for his contributions to science in the development of the gas-filled incandescent lamp, of the thoriated filament for thermionic emission of atomic-hydrogen welding, of phase-control operation of the "Thyratron" tube and in fundamental research in oil films.

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Power Plant Executives Shift Positions

To broaden the experience of several hydro-electric station superintendents on subsidiary properties of the New England Power Association, these officials have been transferred. Harry A. Ostrom, who has been in charge of the Bellows Falls, Vt., plant of the Bellows Falls Hydro-electric Corporation since its construction, about eight years ago, has taken over the Vernon station of the Connecticut River Power Company; Everett E. Stockwell, for the past five years superintendent at Vernon, has become superintendent of the Harriman station of the New England Power Company on the lower Deerfield River in Vermont, and William Hooper, who has headed the staff at Harriman for about ten years, has gone to Bellows Falls.

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▶ J. A. REICH has been appointed assistant chief engineer of power and substations of the El Paso Electric Company, El Paso, Tex. This new appointment brings Mr. Reich back to the El Paso properties after an absence of eleven years. Since 1924 he has been with two other companies in the Engineers' Public Service group, having spent four years at San Juan, P. R., and seven years with the Virginia Electric & Power Company at Richmond.

▶ MARION L. RAMSAY, a Washington newspaper man, was recently appointed personal assistant to Morris L. Cooke, rural electrification administrator. Mr. Ramsay for the last ten years has been a correspondent for the Universal Service, specializing in public utility, financial and other economic subjects.

▶ H. W. NEWELL, vice-president in charge of sales for the Frigidaire Corporation, has accepted the vice-presidency of the Gayer-Cornell Company, Inc., advertising agency in New York.

Pennsylvania Railroad Promotes J. V. B. Duer

J. V. B. Duer, electrical engineer of the Pennsylvania Railroad, who supervised the electrification work between New York, Philadelphia, Baltimore and Washington, has been promoted to the position of chief electrical engineer of the company. In the recent project Mr. Duer supervised not only the roadway construction but also the designing and construction of the new stream-lined electric locomotives.

J. V. B. Duer

Following graduation from Stevens Institute of Technology in 1903, Mr. Duer took the apprenticeship course of the General Electric Company, specializing in railroad work. In 1905 he became associated with the engineering firm retained in connection with the electrifying of the Long Island Railroad's eastern lines. The following year he entered the Long Island Railroad service, where he remained until he transferred to the Pennsylvania in 1910. Mr. Duer was appointed electrical engineer for the Pennsylvania Railroad in 1919 and the following year his duties were extended to cover the entire Pennsylvania Railroad system. Mr. Duer is a fellow of the American Institute of Electrical Engineers, chairman of the Electrical Section of the Association of American Railroads and a member of the Saint Nicholas Society of New York.

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▶ DANA H. HOWARD, for 34 years superintendent of advertising of the Commonwealth Edison Company, Chicago, retired from active duty on July 1. Mr. Howard has devoted his entire business career to advertising and he made many contributions to the advancement of the art. After a brief experience as a printer at Bloomington, Ill., he became advertis-

ing manager of a bicycle company, next director of exhibits for Swift & Company, then supervisor of the Chicago Directory Company. He resigned this position in 1901 to join the company with which he was to spend the remainder of his active years. Veterans in the field still recall one of Mr. Howard's pioneering efforts in electrical advertising, a booklet entitled "Doing It Electrically," issued to promote the use of electric household appliances.

▶ L. R. KING, president of the Iowa-Nebraska Light & Power Company, Lincoln, was elected president of the Nebraska Electrical Association at a recent meeting in Omaha. He succeeds J. R. Jaquet of McCook, Neb. Frank Kruesi, president of the Northwestern Public Service Company, was named vice-president of the association.

▶ RICHARD L. HOLMES, formerly of the Union Equipment & Supply Company, Providence, R. I., has been appointed resident manager, and Robert W. Waterman has been made service manager of the General Electric Supply Corporation's new branch establishment in Manchester, N. H. Willard Richardson, manager of the Springfield, Mass., branch, has been transferred to the managership of the branch at Worcester, Mass., and Charles A. Smith, formerly at Worcester, has been made manager at Springfield.

▶ H. K. DUTCHER, managing director of Hydraulic Engineers, Ltd., and a member of the engineering firms of Dutcher, Maxwell Company and Du Cane Dutcher & Company, Vancouver and Calgary, B. C., sailed from Vancouver on July 17 to accept an engagement for one year in charge of engineering work, with Australian engineers, on a $7,000,000 water power and irrigation project for the Australian Hydro-Electric Commission. During the absence of Mr. Dutcher, Col. J. F. Keen will act as managing director of Hydraulic Engineers, Ltd.

▶ GALT F. PARSONS, district power sales engineer of the New England Power Engineering & Service Corporation, with headquarters at Quincy, Mass., was elected chairman of the Power Engineers' Association at the annual meeting in Wrentham, Mass., on June 27. Prior to his connection with the New England Power Association properties Mr. Parsons was prominently identified in industrial power sales work with the utilities operated in the Massachusetts Utilities Associates group.

▶ RUSSELL HASTINGS, for the past fifteen years associated with Arthur S. Knight, public utility rate consultant, Boston, has joined the staff of the Edison Electric Illuminating Company of Boston as rate engineer, effective July 1. Mr. Hastings was graduated from the Massachusetts Institute of Technology in 1911, and after a short period of service with the Westinghouse Electric & Manufacturing Company and Boston Elevated Railway's department of electrical engineering, he was employed in the purchasing bureau of the Boston Edison company until the World War, when he served in the fuel administration at Washington. Since returning to Boston he has been closely identified with the Edison company's rate problems through his connection with the Knight offices.

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D. W. Roper Retires

After 32 years with the Commonwealth Edison Company, Chicago, D. W. Roper retired from active service, July 1, last. Mr. Roper is widely known as an authority on underground cables and in the field of lightning protection he has

D. W. Roper

made particularly valuable contributions to engineering progress. For many years Mr. Roper has been prominently identified with committees studying research and operating problems concerned with power cables specifically as well as with the broad field of distribution system design and performance. An outstanding phase of his work is related to high-voltage transmission line cables, his experiments being directed toward reduction of insulation thickness with corresponding decrease in diameter and cost of these cables. Prior to 1903 Mr. Roper was for a time assistant to Charles P. Steinmetz. He has also been associated with the Niagara Falls Power Company and the Missouri Edison Company in St. Louis. He entered the employ of the Chicago company in 1903 and two years later he became assistant to the chief operating engineer. He was superintendent of the street department from 1915 to 1933, when he assumed the duties of assistant electrical engineer in charge of the research division of the engineering department.

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▶ A. G. BUCHHOLTZ, manager Northern States Power Company, Sioux Falls, S. D., has been elected president of the North Central Electric Association.

▶ W. J. NIEBERGALL, power engineer of the Illinois Northern Utilities Company, at Dixon, has been advanced to the position of district superintendent, with headquarters at Freeport. He will take over his new duties on August 1, relieving the present superintendent, George R. Fluehr, who is leaving to accept an executive position with the Kuhlman Electric Company at Bay City, Mich.

▶ DANIEL R. WEEDON, formerly of the engineering staff of the Westinghouse Electric & Manufacturing Company, later active in the textile machinery-making field and more recently connected in an executive capacity with the Keasbey & Mattison Company, asbestos products processors at Ambler, Pa., has been made vice-president and sales manager of the Sayles Finishing Plants, Inc., Saylesville, R. I.

▶ HARTWELL POND is now manager of Hartwell Pond, Inc., recently established as New England distributor for the Birdseye Electric Company formed to manufacture standard incandescent lamps at Gloucester, Mass. Headquarters of Mr. Pond are in Boston, Mass., and associated with him in sales activities are J. A. Savage, for twelve years hydro-electric specialist in the Boston office of the General Electric Company, and Wolcott Fuller, for the past three years in the General Electric central station department.

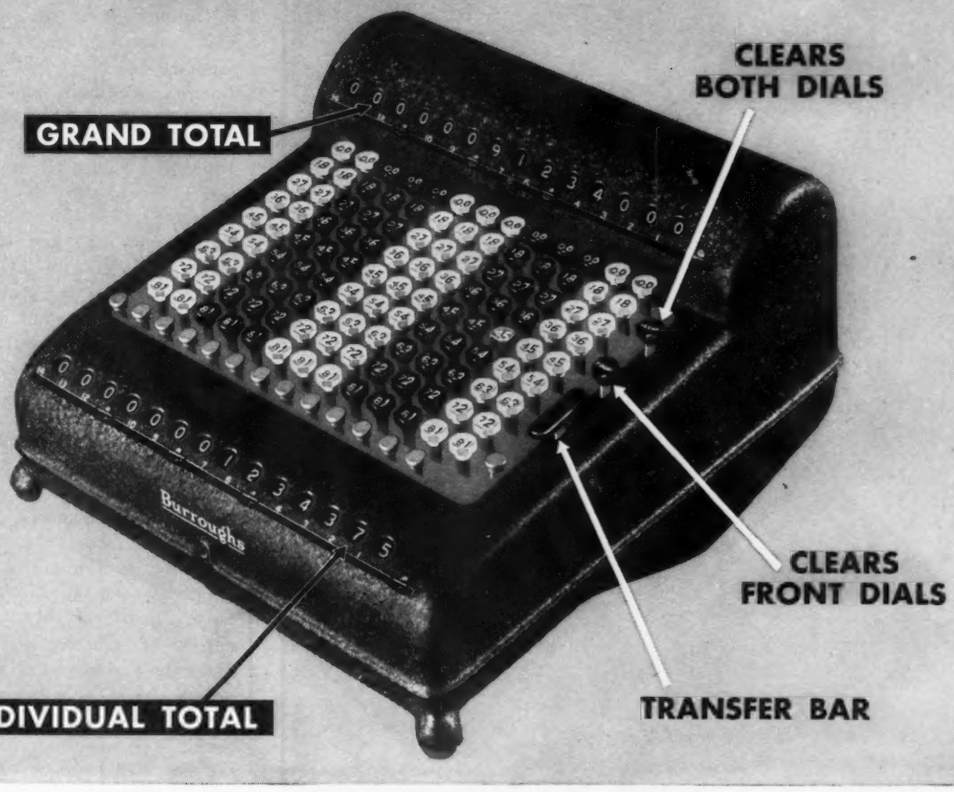
OBITUARY

▶ WILLIAM S. HADAWAY, illuminating engineer of the Westinghouse Lamp Company, died in Belleville, N. J., June 6, of injuries received in an automobile accident which occurred May 29. He was 38 years of age. Graduated from Cornell University in 1920, Mr. Hadaway entered the employ of the Edison Lamp Works as a factory engineer, later assuming duties in lighting engineering work. In 1929 he joined the commercial engineering department of the Westinghouse Lamp Company, Bloomfield, N. J., as illuminating engineer. In his fifteen years of employment in the electrical industry Mr. Hadaway has engaged in lighting work of every description, from manufacturing to application. At the time of his death he was active in the design of lighting installations in commercial and industrial fields. Mr. Hadaway was a member of the Illuminating Engineering Society.

▶ FREDERICK N. CONNET, long chief engineer of the Builders' Iron Foundry, Providence, R. I., and a celebrated inventor of devices for the measurement

Burroughs

DUPLEX CALCULATOR



COMPLETE ELECTRIC OPERATION

TWO SETS OF DIALS — Individual totals are obtained in front dials, then transferred electrically to rear dials for accumulation into a grand total. The two sets of dials are well separated to avoid confusion.

ELECTRIC TRANSFER — Touching the transfer bar enters the amount of the individual total in rear dials electrically, and clears the front dials.

ELECTRIC CLEARANCE — A single touch of a key clears the front dials without transferring; another key clears both dials simultaneously. Both operations are electric. No cranks to turn; no levers to pull.

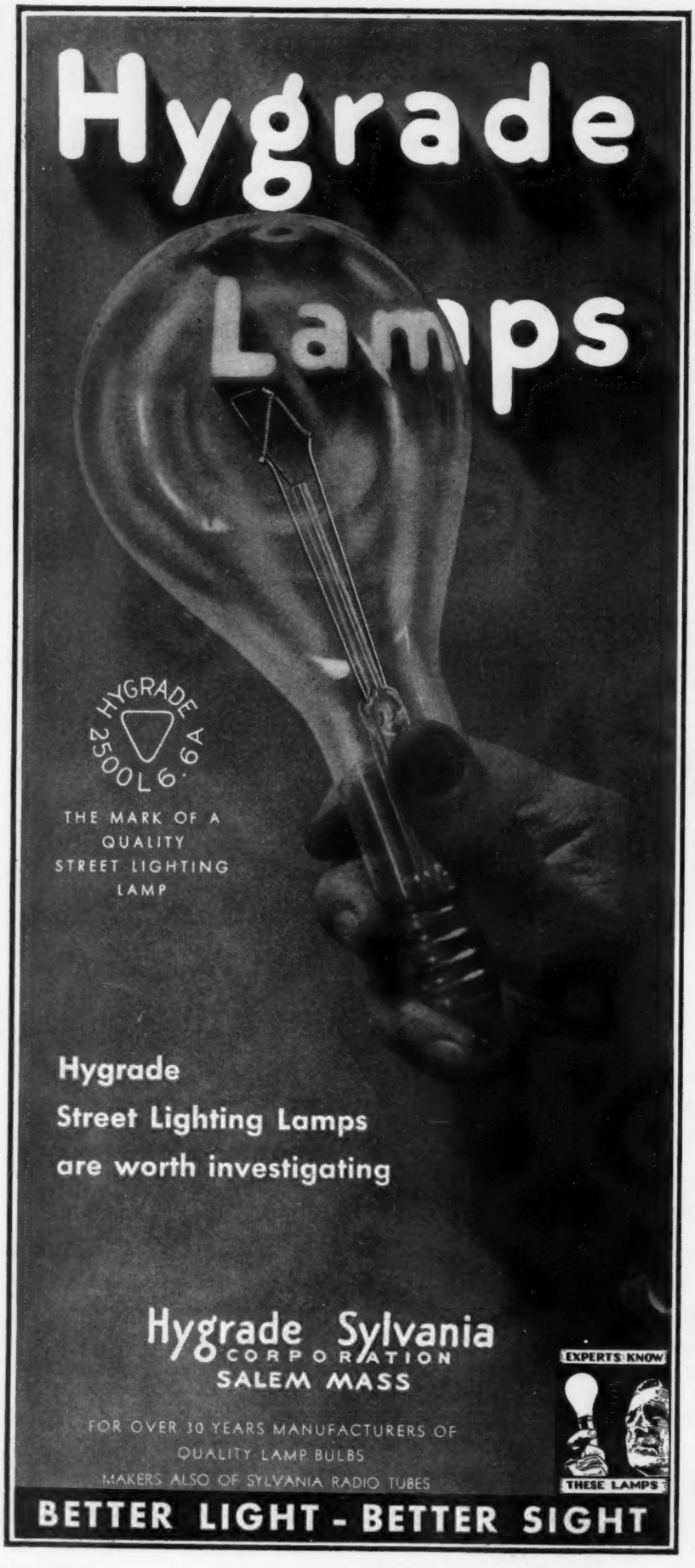
FASTER SUBTRACTION — Entirely new feature provides the simplest method of subtraction on any key-actuated calculating machine.

FRACTIONAL CENT — The machine gives, or takes, the half-cent as desired; or accumulates fractional amounts in the normal way.

OTHER ADVANTAGES — The Duplex, like other Burroughs Electric Calculators, has a uniform light touch for all keys; fast, positive action; and is completely controlled with one hand. Accuracy is electrically enforced. The motor does the work.

The Duplex is furnished in 9 and 13 column sizes. Write for illustrated folder.

BURROUGHS ADDING MACHINE COMPANY
DETROIT, MICHIGAN



and control of the flow of liquids, died at his home in that city June 18, following an illness of about five years. He was born in Flemington, N. J., in 1867, was educated at Stevens Institute and was the inventor of the automatic register used with the Venturi tube and many other important appliances of engineering interest. He was a holder of the John Scott medal of the Franklin Institute.

▶ GEORGE HARLOW, manager of the plant sales department of the Metropolitan-Vickers Electrical Company, Ltd., London, England, and for some years director of the Metropolitan-Vickers Electrical Export Company, Ltd., died June 18. Educated at Manchester College of Technology, he joined the Metropolitan-Vickers Company in 1903 as an apprentice. He was appointed to the staff in 1906 and held posts in the switchgear and transformer engineering and later in the plant and turbine sales departments. He spent a period of four years representing the company in Australia and three years in South America, both at times of important developments in the company's business in those areas.

▶ JOHN H. ROEMER, Midwest utility lawyer and former chief counsel of H. M. Byllesby & Company, Chicago utility concern, died at Elmhurst, N. Y., on July 7, at the age of 69. Mr. Roemer, a native of Clarington, Ohio, attended Marietta College and received his law degree from Yale University. He lectured at Yale and the University of Wisconsin and was instrumental in organizing the Wisconsin Street Railways Commission. He had also been senior partner in the Chicago law firm of Cummins, Roemer & Flynn.

▶ WALTER F. STEVENS, superintendent of the supply department of the Edison Electric Illuminating Company of Boston, died June 15 at his home in Newton, Mass., following an illness of six weeks. He was born in Roxbury, Mass., 61 years ago and after graduating from the Massachusetts Institute of Technology, in 1895, entered the Edison company's service, where he spent his entire life.

▶ WILLIAM H. POWELL, an electrical engineer for the Allis-Chalmers Company for 27 years, died July 8 at his home in Milwaukee at the age of 68. Mr. Powell was graduated from Cornell University in 1890 and for eighteen years was the head of the Bullock Manufacturing Company, Cincinnati, Ohio. In 1908 he became associated with the Allis-Chalmers company. He is a fellow of the American Institute of Electrical Engineers and a member of Sigma Xi, national honorary engineering society.

Special River Crossing TOWERS *in a 50-mile Line*

ADVANCED modern design is typified in the specially constructed towers that carry the high-voltage lines of the Appalachian Electric Power Company over the Ohio River at Kenova, W. Va. Strung at present for a single circuit, they are capable of double-circuit installation whenever that is required. They are 240 feet in height, have a maximum leg-spread of approximately 70 feet at ground level, and carry a river span of 1917 feet, with adjacent spans of 1460 and 1552 feet tying into the standard line in either direction.

American Bridge Company designed and fabricated the two river-crossing towers and also the 88-foot standard towers that make up the rest of the fifty-mile line. • A thoroughly organized department of American Bridge Company designs, fabricates and erects steel towers of all types, also sub-stations, radio towers and similar structures for various branches of industry.

Towers, 132 K. V. Line, Institute, W. Va., to South Point, Ohio.

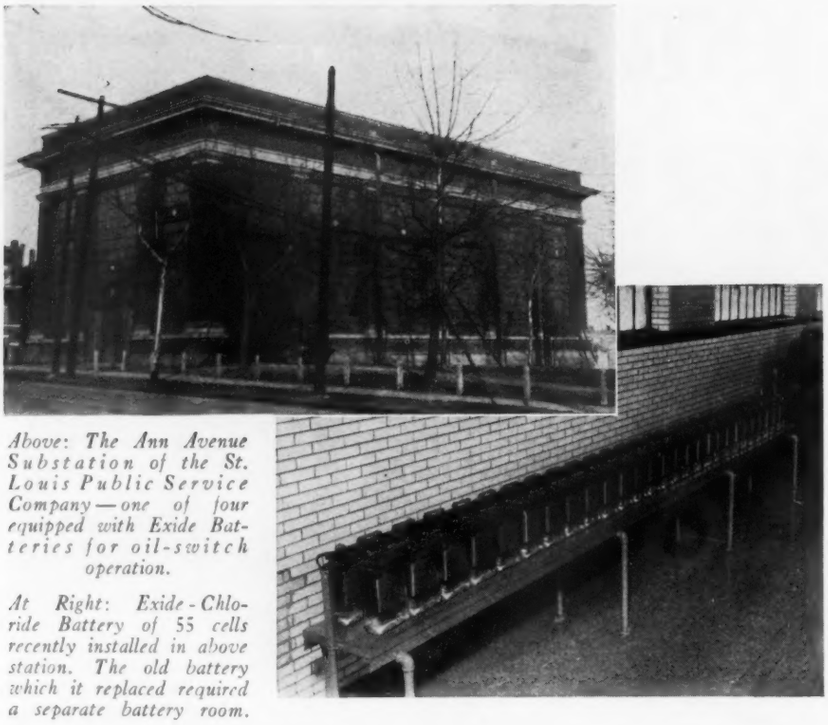
AMERICAN BRIDGE COMPANY

GENERAL OFFICES: *FRICK BUILDING • PITTSBURGH, PA.*

Baltimore Boston Chicago Cincinnati Cleveland Denver Detroit Duluth Minneapolis New York Philadelphia St. Louis Salt Lake City

Pacific Coast Distributors: Columbia Steel Company, San Francisco • *Export Distributors:* United States Steel Products Company, New York

United States Steel Corporation Subsidiary



Above: The Ann Avenue Substation of the St. Louis Public Service Company — one of four equipped with Exide Batteries for oil-switch operation.

At Right: Exide-Chloride Battery of 55 cells recently installed in above station. The old battery which it replaced required a separate battery room.

Exides Protect St. Louis' Street Railway System

THE 55-cell Exide-Chloride Battery illustrated above has recently been installed in the Ann Avenue Substation of the St. Louis Public Service Company, which is also shown.

This is one of four similar Exides, located in as many of the Company's substations, which operate the oil switches that control power distribution to St. Louis' street railway system. In addition to this important normal service, these batteries, in case of a power interruption, will provide ample light in the substations to enable attendants to perform their various duties until the emergency is over. Added interest is given to the above installation in that this modern Exide-Chloride with its sealed glass cells requires no separate battery room as did the old battery which it replaces. On the contrary, it may be located close to delicate electrical mechanism without harm to the latter.

You may or may not need an oil switch battery in your plant. But for whatever purpose you *do* require storage batteries, you may choose Exides with the same confidence that their performance has inspired in other engineers, everywhere.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

Exide

BATTERIES

New Dealers Covet the Utilities

[*Continued from page 39*]

social reformer who would not only save his life, but his face and pet experiments, and the other the plain American who does not pant for reform and experimentation but only for the right to comfort and security.

It is no news that the American people like stability. That is as true of Americans who are "social-reform minded" as it is of those who are not. So it is not difficult to understand the social reformer trembling as his reforms begin to threaten national bankruptcy, gazing wildly around for some surviving signs of a stability he can tie to. Likewise, it is not difficult to understand why most other Americans should want to turn a death sentence for a capable industry into a reprieve, at a time like this, anyway. Nor is it difficult to understand their distaste for the spectacle of a bunch of social experimentalists planning to pay for the wreckage of their crack-pot schemes of government, and to finance bigger and better ones, with the money people pay for an honest public service.

At any rate, some of the apparent reasons for the recent noise of strife at the seat of the national government thus become clearer. It was a struggle to get aboard a life-raft which, properly navigated, can help to save all hands.

•

Forecasts Improvement in Capital Goods

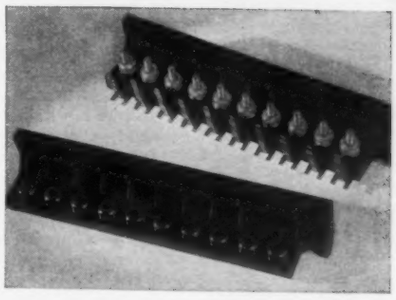
Despite legislative wrangling in Washington, business confidence in fall prospects is still high, says the United Business Service. This optimistic attitude on the part of industrial leaders and merchandisers can be attributed to a number of recent developments. Among these are the abandonment of code restrictions, the continued high cash income of farmers, improvement in residential building, rehabilitation programs in many industries, increased dividend disbursements and the sustained high level of automobile sales. The United Service forecasts that further progress in industrial and housing renovation will take place this fall. It points out that considerable time will be required to fill the accumulated needs for equipment which has depreciated or become obsolete during the depression. The service believes, however, that the recent improvement in the sales of "capital goods" is the beginning of a long upward trend. "Cheap money" is a strong incentive to rehabilitate industrial facilities.

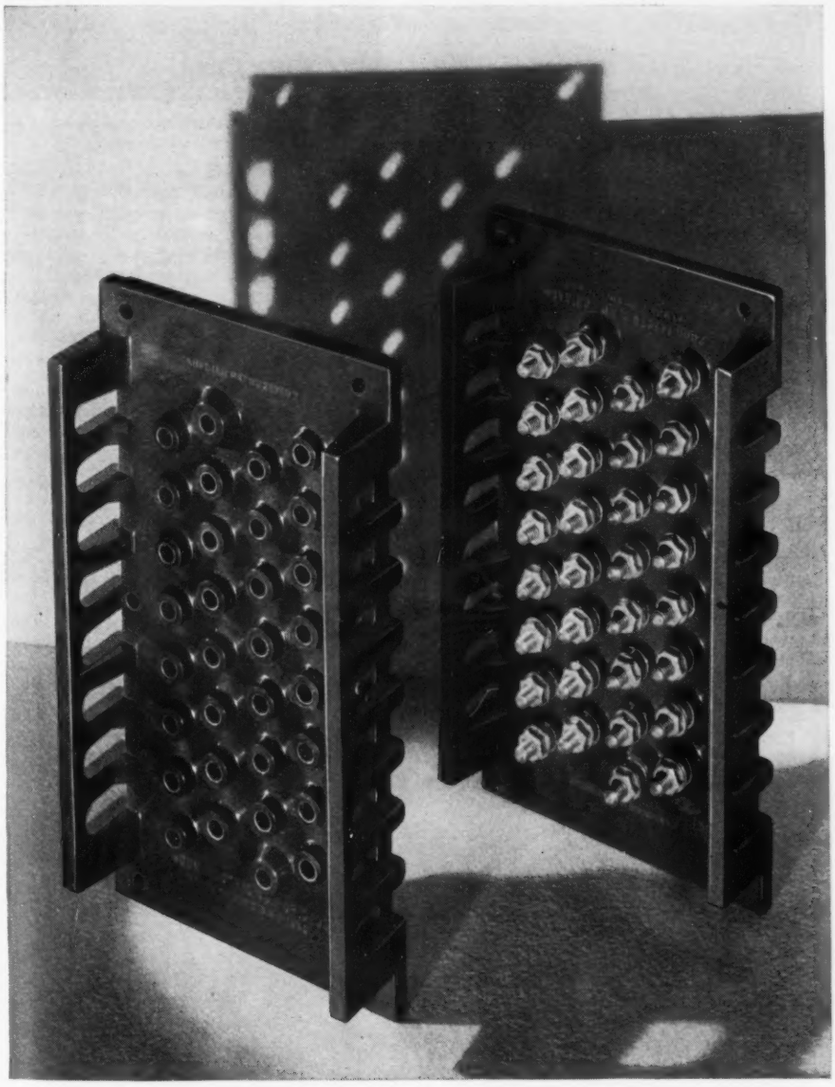
UNIMPAIRED . . .

after Five Years Exposure

INSULATION BLOCKS of unprotected pole cable terminals are continuously subjected to the elements. They are attacked by rain, sleet, snow, heat and cold. Five years ago Bakelite Molded terminal face plates were introduced and their highly satisfactory performance has resulted in their wide adoption.

These Bakelite Molded face plates have replaced the former plates made of wood and porcelain. To quote Cook Electric Co., who pioneered in the use of Bakelite Molded for this service, "The ability of Bakelite Molded to withstand the elements, its high tensile strength, its high insulation value, plus its low absorption properties justified our adopting it five years ago . . . the telephone industry is slow to adopt new products but telephone engineers readily accepted Bakelite Molded face plates."





In addition to service advantages, the use of Bakelite Molded also offers production and assembly advantages. It is readily and accurately formed into any desired shape, with all necessary ribs, channels, bosses, lugs, through-holes, and markings, and, when required, with metal inserts firmly embedded.

An excellent idea of the possibilities of Bakelite Molded may be gained by reading our illustrated booklet 3M, "Bakelite Molded", a copy of which will be sent promptly upon receipt of your request.

★

Photographs show Bakelite Molded face plates, before and after inserting terminals, for pole lightning arrester made by Cook Electric Co., Chicago.

BAKELITE CORPORATION, 247 Park Avenue, New York, N. Y. . . . . 43 East Ohio Street, Chicago, Ill.
BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

REGISTERED U. S. PAT. OFF.

"The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products"

THE MATERIAL OF A THOUSAND USES

NEW EQUIPMENT

Vacuum Power Switch

Use of tilting or rotating devices in making or breaking contacts have been obviated in this new switch which is used in remote control and high-voltage installations for sign flashing, traffic lights and equipment control. A solenoid controls the position of a contacting mechanism which is sealed in a high vacuum chamber to prevent difficulties from oxidation, dust, lint or inflammable gases.

Types VPS-1 and VPS-2, single pole, single contact, normally open and normally closed respectively; load ratings, 20 amp. at 110 volts; 10 amp. at 220 volts; maximum operating speed at full load 100 contacts per minute. **Continental Electric Co.**, St. Charles, Ill.

•

Electric Hammer-Drill Combination

A universal type motor, with forced-draft ventilation, drives this tool, which can be converted from a drill to an electric hammer

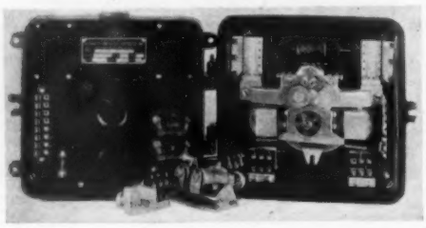
Capacity as a drill, ½ in. in metal; as a hammer, up to 1¼ in. diameter in concrete; operates on 110 volts. **Wodack Electric Tool Corporation**, Chicago, Ill.

by opening the chuck and loosening a cap screw. Used as a hammer with a star drill, the tool cuts concrete and masonry; with special tools it does chipping, chiseling, cutting and vibrating.

•

Time Control Unit

Designed to repeat one or two operations as often as desired, this unit provides flexible choice of periods during which the controlled actions take place. The time controls will handle a repetitive action requiring a definite time period or cycle with either the same or different time periods between successive cycles. The time cycle and the interval between cycles is infinitely adjustable.

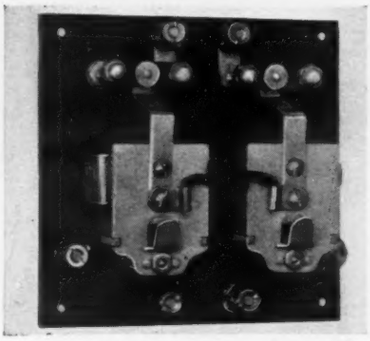


Series 1274—5-6; operates on 110 volts or 220 if specially ordered. **Automatic Temperature Control Co.**, Philadelphia, Pa.

•

Heavy-Duty Flasher Relays

Inrush currents resulting from flashing of high-wattage lamps in lighthouse and airway beacons are largely eliminated by this relay system. Two front contact relays, one



Panel mounting; standard relays used; ample capacity in relays to handle inrush currents. **Struthers Dunn, Inc.**, Philadelphia, Pa.

provided with blow-out coils, are used. Energizing the first relay lights the lamp in series with a resistor. As the voltage drop across the lamp reaches 70 per cent of the line voltage the second relay closes, applying full voltage to the lamp. In opening the circuit the relay with the blow-out coils opens first, preventing excess arcing.

•

Photo-Electric Cell

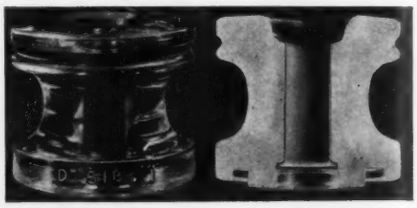
Consists essentially of two metal electrodes hermetically sealed in Bakelite between which light-sensitive material is exposed to incident light rays through a

Operated on a.c. or d.c.; available single, or in assemblies containing cell, relay, tube, resistances, socket, etc. **Hugh H. Eby, Inc.**, Philadelphia, Pa.

quartz window. The cell reacts to both the frequency and intensity of incident light and is sensitive in both the generative and emissive classes. Used as a component of a circuit, it will operate relays, deflect sensitive meters or, connected to a vacuum-tube amplifier, will perform operations in one ten-thousandth of a second.

Insulator Has Lead Sleeve

Development of a spool-type glass insulator bushed with a lead sleeve has resulted in an insulator stated to have exceptional ability to withstand dead-end or line pull. The lead sleeve has a uniform diameter,



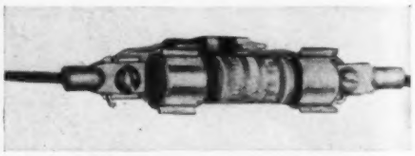
Hemingray Division, **Owens-Illinois Glass Co.**, Toledo, Ohio.

serves as a cushion against stresses and protects the glass from contact with the bolt. The added mechanical strength provided by the lead bushing assures a longer life and lower maintenance cost than was formerly possible with plain glass bushings.

•

Detects Dead Fuses

This neon tattletale lamp when connected directly in parallel with either cartridge or plug fuses draws no current until the fuse blows, when it lights, indicating the dead fuse.



Dimensions 1⅛ x 5/16 inches; used with 100 to 550 volts. **Littlefuse Laboratories**, Chicago, Ill.

•

Open-Type Floodlight

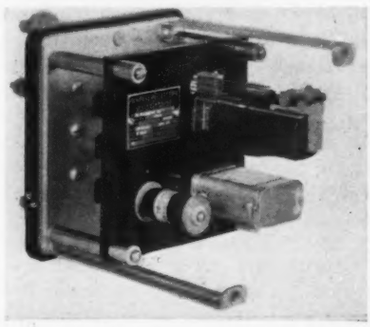
Designed for lighting service stations and driveways, this open-type floodlight is strongly built of sheet steel and cast aluminum. A double fire-enamel finish provides a durable reflecting surface and long life. An auxiliary parabolic reflector is available

Mounting types—Swivel and rocker, pipe-clamp, pipe-top, crossarm and slip-fitter. Lamp sizes accommodated—300, 500, 750, 1,000, 1,500 watts. **General Electric Co.**, Schenectady, N. Y.

with which a more or less concentrated beam can be superimposed upon the general distribution of light from the unit. This arrangement provides a higher level of illumination for areas requiring emphasis.

Ground Detector Relay

Used to trip a breaker or give a signal to indicate a ground, this relay may be installed in any station where delta-Y connected power or potential transformers are



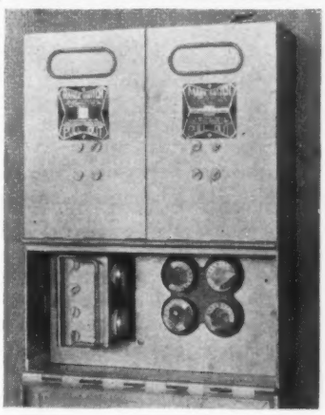
General Electric Co., Schenectady, N. Y.

located. The equipment consists of a coupler unit and a relay unit; the relay unit is made up of a potential relay, condenser and resistor operated from a Thyratron tube, which is operated in turn from a Thyrite coupler connected across one phase of the three-phase ungrounded high-voltage line.

•

Service Connection Device

Including a main switch, with range, light and water heater branches for use with the new sequence metering, this main service connection device is said to effect economies in space and installation labor costs.



For flush or surface mounting; rating 60 amp.; Catalogue No. 4244 HW. **Palmer Electric Company**, Waltham, Mass.

•

Diesel Starting Batteries

To provide adequate voltage characteristics for starting Diesel engines with the required high cranking speed this new line of

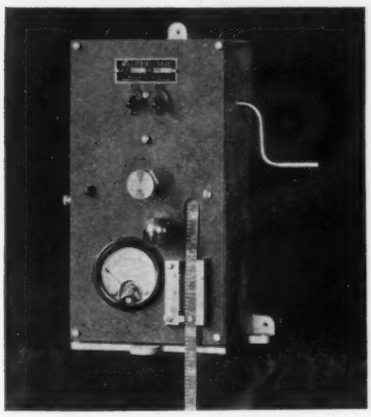
Available in range of sizes for engines from 25 to 600 hp. where voltage requirements vary from 12 to 115 volts and current from 300 to 1,600 amp. **Electric Storage Battery Co.**, Philadelphia, Pa.

batteries has been designed to give high current at low temperatures. They are designed and constructed for truck, tractor, bus and road construction machinery. Heavy flexible lead-plated copper connectors between cells are used to eliminate breakage from vibration. Likewise, heavy, hard rubber monobloc containers are provided.

•

Electric Water Gage

Supplanting the old hook gage for determining water level at weirs and dams, this instrument will give readings accurate to 1/1,000 of a foot. Readings are taken on a graduated stainless steel tape wound on an insulated spool within the case. The tape is connected through a resistance, a milliam-



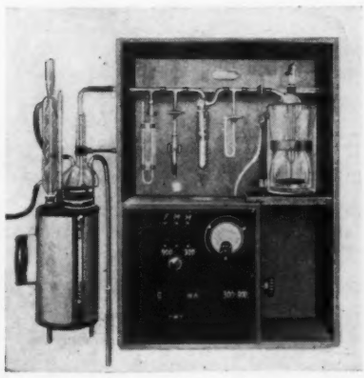
"Millipoint Gage," type 25; dimensions 10x7x6 in. **R. C. Burt Scientific Laboratories**, Pasadena, Calif.

meter and a switch to a 4.5-volt battery grounded to the case and thence to a ground connection in the water. In making measurements the tape is unwound, lowering a brass plumb bob until it point contacts the water, completing the circuit and causing the needle of the meter to jump. A tape reading then indicates the height of the water.

•

Oil-Oxidation Tester

Used for making oxidation tests on transformer oils, turbine oils, varnishes, paints and lacquers, this apparatus gives data on the rate of aging of these materials. Oil



"Oxydator." **Herman A. Holz**, New York City.

or the liquid to be tested is exposed to the action of oxygen. The electric current used to produce the oxygen absorbed in a given period by the material under test is measured; the data obtained are an exact measure of the rate of aging of the substance.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Theory of operation of crystal-valve lightning arresters for the protection of overhead line transformers is discussed in a 15-page booklet recently announced by the Electric Service Supplies Co., Seventeenth and Cambria Streets, Philadelphia.

"Pyranol capacitators" for power-factor improvement is the subject of General Electric Company's new 26-page publication, GEA-77H. The selection and application of these capacitors is fully described with the aid of vector diagrams, charts, tables and wiring diagrams.

Operation of a device for automatic paralleling of a.c. generators is outlined in a 4-page leaflet (No. 2202) available from the Allis-Chalmers Co., Milwaukee, Wis. Wiring diagrams illustrate the application of the device to various circuits.

A complete line of high-voltage switches and rural service fuses is described in bulletin No. 26 of the Hi-Voltage Equipment Co., 2891 East 79th Street, Cleveland, Ohio. Detail drawings and specifications of the switches are given as well as characteristic curves and oscillograms to illustrate the operation of the fuses.

Cover-type bushing transformers for distribution lines are discussed in a 7-page bulletin (No. 35510) announced by the Moloney Electric Co., St. Louis, Mo. Features of this design are discussed with the aid of section drawings and specification tables.

Solenoid valves for automatic and remote control of steam, gas, liquids and air are listed in a recent bulletin of the Automatic Switch Co., 154 Grand Street, New York. Wiring diagrams are provided which show application and control, while tables are given which give data on capacity and power consumption of the valves.

Cross-section drawings, dimensions and capacity tables, application pictures, wiring diagrams and a generous amount of text detail the operating features of Ohio lifting magnets in bulletin 109 (14 pages), available from the Ohio Electric Manufacturing Company, Cleveland.

Uses, control and operation, construction features and specifications of electric muffle furnaces are listed and illustrated in the 4-page bulletin (HD-535) recently published by the Hevi-Duty Electric Company, Milwaukee, Wis.

Two 20-page bulletins available from Ilg Electric Ventilating Company, 2850 No. Crawford Avenue, Chicago, illustrate applications of air-conditioning and air-circulating systems to homes, offices and stores. Testimonial letters from users are reproduced. Schematic diagrams illustrate the principle of operation of the "Ilgattic" circulating system as applied to homes and apartment houses. Instructions for selecting proper equipment are included.

Catalog H (181 pages), announced by the General Radio Corporation, Cambridge, Mass., lists and describes with specifications and characteristic curves a complete line of electrical test instruments. An appendix contains engineering formulas, resonance charts and decibel conversion tables.

Herman A. Holtz, 167 East 33d Street, New York City, describes the operation of the "Oxydator," an instrument used in determining the rate of aging of transformer oils and insulating compounds in a nine-page bulletin entitled "The Oxydator."

WHAT'S HE PLAYING, TRAINS?
NAW, HE WENT BUGS TRYING TO CORRODE COPPER-BEARING STEEL!
?
all B-C Hi-Line Hardware is drop-forged from 1035 copper-bearing steel-proven by test,
THE BREWER-TITCHENER CORP., CORTLAND, N.Y.
·THROUGH YOUR INSULATOR MANUFACTURER ONLY·

Municipal Items

The City Council's advisory committee of Corpus Christi, Tex., has given its unanimous approval to the application of the Central Power & Light Company, now serving the city, for a 30-year city franchise. According to the franchise as prepared by the power company and city attorneys, the power company will pay the city $500 with the final passage of the ordinance and $500 annually, beginning 30 days after the ordinance becomes effective.

•

Construction of a municipal hydro-electric plant on the Gasconade River, which would supply the electricity needs of the city of St. Louis and leave 105,000 kw.-hr. a year for sale to one of the existing utilities, was proposed to city officials by Allen L. Snyder, formerly engineer in charge of construction of the Union Electric Light & Power Company's hydro-electric plant near Bagnell, Mo. The Gasconade River Power Company, with which Snyder is associated, has made all of the necessary surveys, borings, maps and plans, and has obtained a government permit. The total cost of the project, including substations and a duplicate transmission line to St. Louis, is estimated at $11,000,000, of which about $5,000,000 might be obtained from the government in the form of a P.W.A. grant.

•

United States District Judge Lindsey at Danville, Ill., has taken under advisement the suit brought by the Illinois Power & Light Corporation to enjoin the city of Centralia, its officials and Harold Ickes and the Federal Public Works Administration from proceeding with the construction of a municipal light and power plant here. The plaintiff claims that in 1909 it was granted a 30-year franchise to distribute electrical power in Centralia. The P.W.A. some time ago approved a $428,000 loan and $147,000 grant to finance the city project.

•

Contracts totaling $30,000 for materials to be used in the reconstruction of the provincial hydro-electric distribution lines in Portage la Prairie have been placed by the Manitoba (Canada) Power Commission. Largest orders were for wiring. This job will involve an extensive construction project for the provincial hydro in the Red River Valley south of Winnipeg, Man.

•

Detroit's first application for a P.W.A. project on the new 45-55 basis, under which the local community furnishes 55 per cent of the cost and the federal government the remaining 45 per cent, is expected to be an $818,000 power line extension project.

Court of Appeals of the Fifth Appellate District of Ohio has granted the Ohio Power Company a permanent injunction against the construction of a steam-generation plant by the city of Coshocton in connection with a P.W.A. project. The decision reversed the Common Pleas Court verdict.

•

Oklahoma State Planning Board has applied to the P.W.A. for a $15,000,000 grant and loan to finance the construction of a hydro-electric dam and power plant in the Grand River near Vinita.

•

Suit by the Oklahoma Utilities Company to prevent Hominy, Okla., from constructing a municipal electric project with P.W.A. funds, was dismissed recently in the District of Columbia Supreme Court. Appeal of the utilities company is expected to be heard in the district Court of Appeals in the fall.

•

Application of the Alabama Power Company for a permanent injunction against the cities of Sheffield and Tuscumbia borrowing funds from the P.W.A. for construction of their own distribution systems was denied by Judge C. P. Almon in Colbert County Circuit Court at Tuscumbia. Both Sheffield and Tuscumbia at the present time are under federal injunctions granted by Judge W. I. Grubb of Birmingham against borrowing funds from the T.V.A. or to enter a contract with the T.V.A. to buy current.

•

Civic power committee at Edmonton, Alberta, Canada, has voted unanimously to spend $1,064,000 on extending the city power plant as soon as money can be obtained or a manufacturer can be found who will accept city bonds in payment for the equipment. In the meantime, the commissioners have been instructed to proceed with the preparation of specifications and to secure quotations.

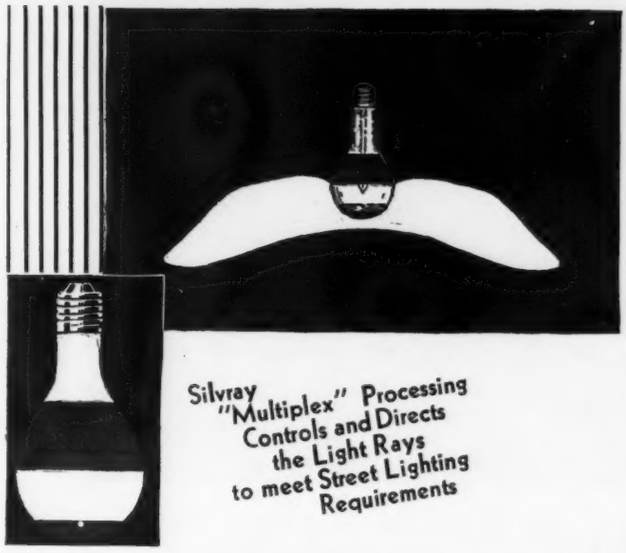
•

The Traction Light & Power Company has filed an injunction suit in the Miami Circuit Court against the Peru, Ind., municipal plant, charging unlawful destruction of property of the company. The basis of the suit is that an intended extension of lines of the municipal plant into territory served by the company is "unfair and illegal competition," according to P. H. Palmer, company division manager.

•

City of Spokane, Wash., may start work immediately on the proposed $687,000 up-river hydro-electric plant and dam for the city water system, with labor furnished by the new Works Progress Administration, according to Commissioner Ralph Hendricks.

MODERN STREET LIGHTING



Public Appeal plus SILVRAY "MULTIPLEX" PROCESSING —can build up your Street Lighting Load

Silvray "Multiplex" Processing permits the Utility to present a clean-cut, widely approved plan to the Local Civic Authorities for an increase in effective illumination of from 30% to 50% — at an annual additional cost about equal to the present cost of street lamp renewals. In Silvray "Multiplex" Processing, Central Station Executives will find an important key to present and future load building.

Silvray "Multiplex" Processing gives *controlled and directed illumination without the use of separate reflecting devices.* It is adaptable to all standard types of street lighting equipment and is highly endorsed and widely used for *efficiently* and *economically* illuminating streets, boulevards, parks, bridges, service stations and other public places.

Write us for further information regarding Silvray "Multiplex" Processing, or ask that one of our Illuminating Engineers call with reference to making a Survey or Recommendations (without obligation).

AMERICAN STREET ILLUMINATING COMPANY

"Backed by 57 Years' Street Lighting Experience"

261 NORTH BROAD STREET . . PHILADELPHIA, PA.

SAVE equipment, real estate, buildings, taxes, distribution feeders.

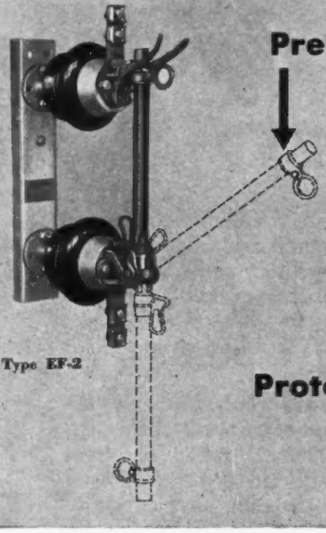
Ask for bulletin GEA-2078

General Electric, Dept, 6A-201, Schenectady, N. Y.

310-12

GENERAL ELECTRIC

HOW THIS DROP-OUT FUSE DISCONNECTING SWITCH



Prevents Leakage

—positive disconnection when fuse blows.

Saves Time

—it's easy to spot and fuse from ground level.

Protects Equipment

—has adequate interrupting capacity for any type of installation.

THIS outdoor, drop-out, fuse disconnecting switch is low in cost, eliminates the need of an additional switch, and uses G-E Type EG-1 fuses—which are reliable and inexpensive. General Electric, Schenectady, New York.

870-1

GENERAL ELECTRIC

SALES OPPORTUNITIES IN NEW CONSTRUCTION

ROANOKE, VA.—Appalachian Electric Power Company has authorized extensions in transmission lines in Tazewell and Buchanan Counties, to connect with present system in vicinity of Richlands, Va., where power substation will be extended and improved, including installation of three 33,000-volt distribution transformers and accessory equipment. Cost about $135,000.

BUFFALO, N. Y.,—American Radiator Company plans installation of motors, controls and other equipment in new plant addition. Cost about $100,000. Building permit has been issued.

SPRING VALLEY, MINN.—Soon takes bids for new city-owned electric light and power plant, using Diesel engine-generator units; also for an electrical distribution system. Fund of $110,000 has been arranged. G. M. Orr & Company, Baker Building, Minneapolis, Minn., consulting engineers.

DENVER, COLO.—Bureau of Reclamation, Denver, asks bids until August 2 for steel transmission towers and switchyard structures for circuits Nos. 2, 4 and 5, Boulder Power Plant, Boulder Canyon Project, Arizona-California-Nevada (Specification 634). Also, until July 25 for one tunnel plug adit car, same project (Specification 700-D).

BEDFORD, IND.—Utilities District of Western Indiana, Rural Electric Membership Corporation, recently organized by Herman W. Koehler, Center Point, Ind. (acting president), Norman Evans, Bedford, and associates, plans transmission lines in rural districts of twelve or more counties in Southern part of State, including Greene, Monroe, Clay, Parke, Putnam, Lawrence and neighboring counties, with distribution lines and power substation facilities for commercial service. A total of 300 miles of lines will be built, estimated to cost about $500,000. Application for permission has been made. Financing through federal aid.

NEW YORK. N. Y.—Washburn Wire Company, foot of East 118th Street, plans installation of motor, controls, conveyors and other equipment in new multi-story steel wire manufacturing plant on neighboring site. Cost over $300,000. Bart and John P. Walther, 103 East 125th Street, are architects.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, closes bids July 26 for three engine-generator sets for Submarine Base (Schedule 5537).

MEMPHIS, TENN.—Plans installation of motors and controls, conveyors, electric hoisting equipment and other apparatus in new city-owned grain elevator on waterfront site on Memphis River, equipped for initial capacity of 1,500,000 bushels. Cost $550,000. Financing is being arranged through federal aid. MacDonald Engineering Company, 1 North LaSalle Street, Chicago, Ill., is engineer.

CHICAGO, ILL.—International Harvester Company has filed plans for new one-story power plant, 50 x 119 ft., for service at works on Blue Island Avenue. Cost over $75,000, with equipment. O. A. Krueger, 606 South Michigan Avenue, is company architect.

VILLISCA, IOWA—Soon asks bids on revised plans for proposed city-owned electric light and power plant, and electrical distribution system. Fund of $140,000 has been arranged. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

SHAWANO, WIS.—Is arranging early

call for bids for new addition to city-owned electric light and power plant, including installation. Auler, Jensen & Brown, ERA Building, Oshkosh, Wis., are architects.

DALLAS, TEX.—D. & B. Pump & Supply Company, Maple Avenue, plans installation of motors and controls, electric hoists, conveyors, etc., in new pumping machinery manufacturing plant in Love Field district. Cost about $100,000.

FORT BENJAMIN HARRISON, IND.—Quartermaster, United States Army, plans new street-lighting system, with underground electrical conduits. Fund of $64,000 is being appropriated.

NEW YORK, N. Y.—WNYC Municipal Broadcasting Station, Municipal Building, plans improvements in plant, including installation of new equipment. Fund of $30,000 has been secured through federal aid.

STOCKTON, CALIF. — Taylor Milling Company plans installation of motors and controls, electric hoists, conveyors and other equipment for rebuilding of portion of feed milling plant, recently destroyed by fire. Cost over $200,000, including machinery.

IOWA CITY, IOWA—Soon asks bids for proposed city-owned electric light and power plant, and electrical distribution system. Fund of $917,000 is available. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, Washington, asks bids until July 30 for 300,000 ft. of copper wire, 5,000 ft. of cable, 100 watt-hour meters, 115 panelboards, electric lighting fixtures, cartridge fuses, 20,000 conduit bushings and other electrical supplies (Schedule 3072).

CHICAGO, ILL.—Crystal Pure Candy Company, 2611 West Chicago Avenue, plans installation of motors and controls, conveyors and other equipment in new one-story addition. Cost close to $85,000. R. Bernard Kurzon, 134 N. LaSalle Street, is architect.

FORT WORTH, TEX.—Universal Mills, Riverside district, plan installation of motors and controls, conveyors, electric hoists and other equipment for rebuilding of portion of feed milling plant, recently destroyed by fire. Cost over $175,000.

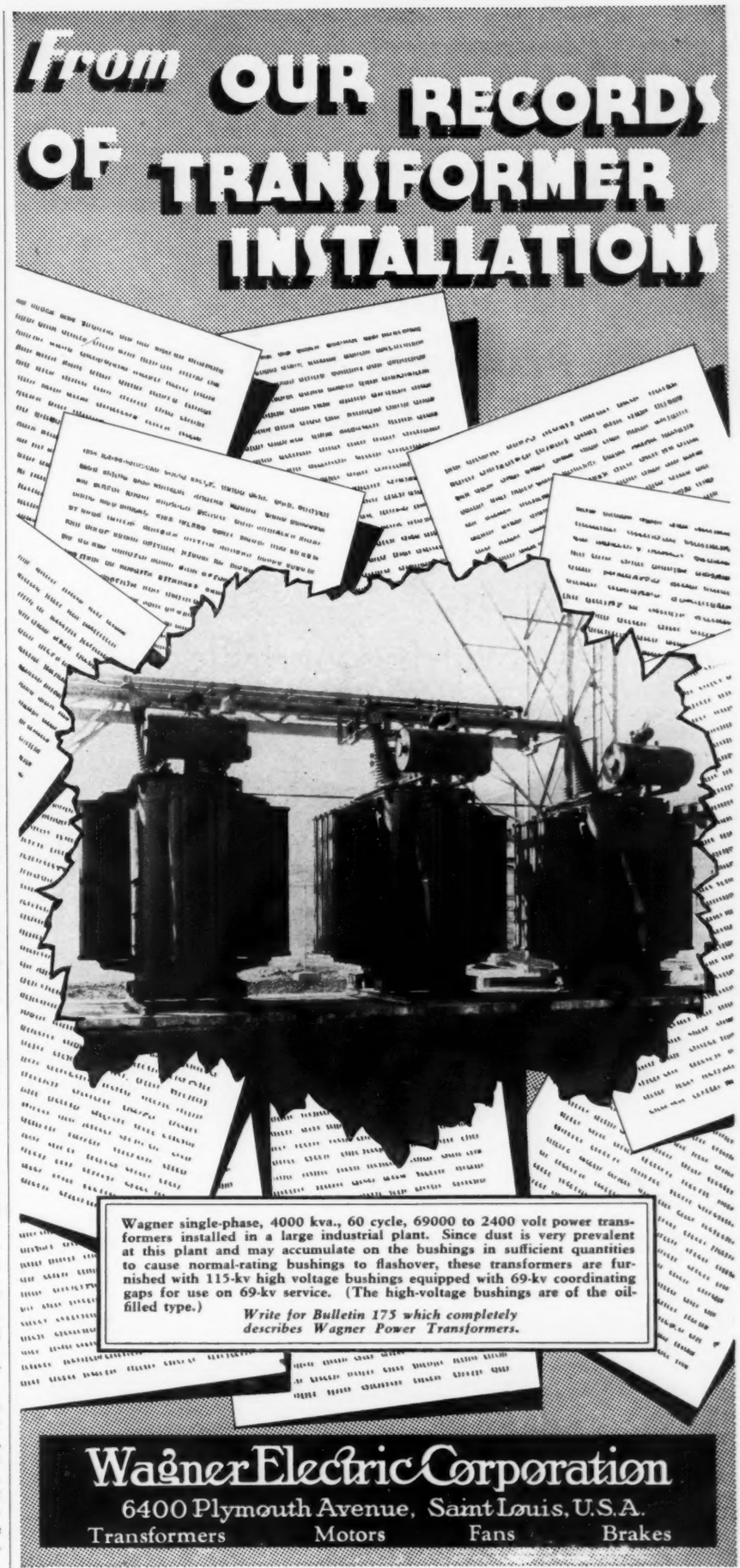
GLADSTONE, MICH.—Plans city-owned electric light and power plant, and is arranging financing in sum of $109,600 through federal aid. Proposed to begin project soon. Shoecraft, Drury & McNamee, Ann Arbor, Mich., are consulting engineers.

LOS ANGELES, CALIF.—D. P. Nicklin, purchasing agent, Los Angeles Water and Power Bureau, 207 South Broadway, asks bids until July 23 for furnishing electric meters in such quantities as may be required for period of one year, beginning August 5 (Specification 1684).

BOONEVILLE, MISS.—Prentiss County Electric Power Association plans extensions in transmission lines to Hills Chapel and vicinity, for local service. Will also make extensions and improvements in recently acquired distributing system at Booneville. Cost about $45,000.

MEADVILLE. PA.—Viscose Company of America, Marcus Hook, Pa., plans installation of motors and controls, conveyors and other electrical equipment in four new additions to cellulose rayon mill. Cost over $175,000.

HUNTINGTON, W. VA.—United States Engineer Office asks bids until August 5 for equipment for Gallipolis Locks, Ohio River, including one 250-kva. gasoline-electric stand-by unit with complete accessories, lighting standards, motor-driven pumping machinery, motor-driven air compressor, six-panel switchboard and instruments, complete electric illumination system for lock, including wiring, conduits, etc.


From OUR RECORDS OF TRANSFORMER INSTALLATIONS
Wagner single-phase, 4000 kva., 60 cycle, 69000 to 2400 volt power transformers installed in a large industrial plant. Since dust is very prevalent at this plant and may accumulate on the bushings in sufficient quantities to cause normal-rating bushings to flashover, these transformers are furnished with 115-kv high voltage bushings equipped with 69-kv coordinating gaps for use on 69-kv service. (The high-voltage bushings are of the oil-filled type.)
Write for Bulletin 175 which completely describes Wagner Power Transformers.
Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.
Transformers Motors Fans Brakes
T235-1

SUPERIOR
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*(BAIS-20)

These Superior Products Will Fit Your Needs:

Overall Meter Enclosures
For Diversion Prevention

Test Switches and Blocks
For Meters and Relays

Sheet Metal Enclosures
For Electric Apparatus

Copper and Sheet Metal Specialties
For Special and Specific Purposes

The SUPERIOR SWITCHBOARD AND DEVICES COMPANY
CANTON, OHIO

* Been At It Since 1920

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Recent Rate Changes

Washington Water Power Company, July 3, filed new promotional residential rates with the state regulatory bodies of Idaho and Washington. The new rate, to take effect August 1, consists of a charge for initial 32 kw.-hr. variable according to consumer density in the particular area, plus 110 kw.-hr. at 3 cents, plus excess over 142 kw.-hr. at 2 cents.

•

S. B. Way, president of the Milwaukee Electric Railway & Light Company, stated that rate reductions recently ordered by the Wisconsin Public Service Commission would be accepted. The reduction, estimated at $550,000 per year on present consumptions, affects customers in Milwaukee, West Allis, Wauwatosa, Shorewood, Whitefish Bay, West Milwaukee and adjacent towns, as well as Kenosha, Waukesha, Watertown, Fort Atkinson, West Bend, Burlington, Whitewater and large rural areas.

•

The Wisconsin Public Service Commission gave approval to special inducement rates offered by the Wisconsin Public Service Corporation, Northern States Power Company, Menominee & Marinette Light & Traction Company and the Midland Public Service Company. These firms serve one-third of the state's area. The new rates apply to customers who used at least 30 kw.-hr. a month last year and who increased their consumption this year. The monthly bill of such a customer will be equal to the corresponding monthly bill of last year, plus a rate of 2 cents for each additional kilowatt-hour used. This is substantially lower than the regular rates.

•

Application has been made by the Georgia Power Company to modify a recent commercial rate reduction ordered by the Georgia Public Service Commission. The company contends that the order will reduce its income $512,000 per year, instead of the $390,000 estimated by the commission, and asks that only part of the reduction be put into effect at present.

•

Kingman and Chloride, mining towns in the northwestern section of Arizona, received a 20 per cent cut in residential rates by a recent order of the state Corporation Commission on the Public Utilities Consolidated Corporation.

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Chairman Edward J. Hopple of the Ohio Public Utilities Commission has announced that on the basis of negotiations where no formal hearing was held, the rates for utilities operating in Ohio have been reduced during the last three months to a point which would mean a saving of $930,726, based on figures for the previous year.